THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XIX. No. 461—22ND YEAR.] LONDON, JUNE 7, 1870. [Subscription { 15s. in Advance. / 18s. Credit. } per Annum. DOUBLE No. Price 1s.

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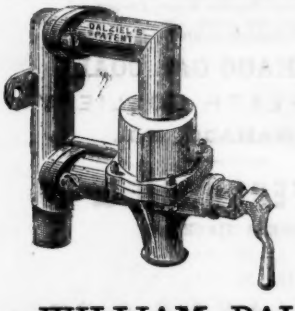

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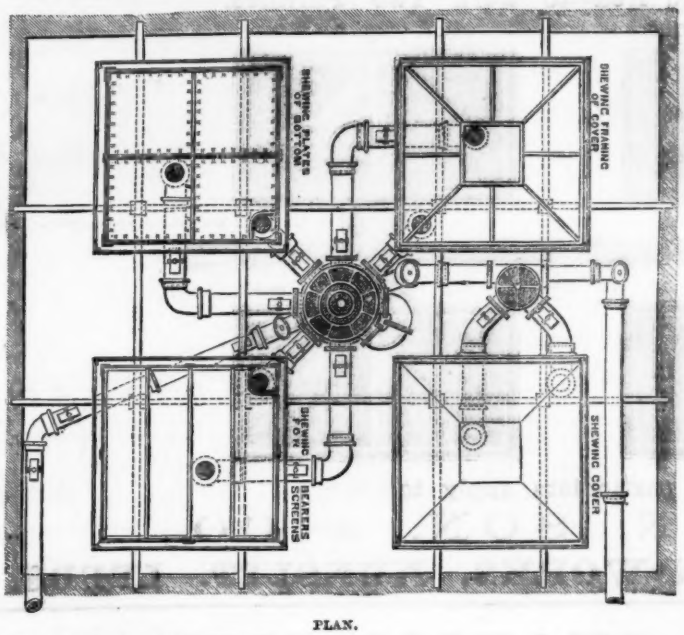
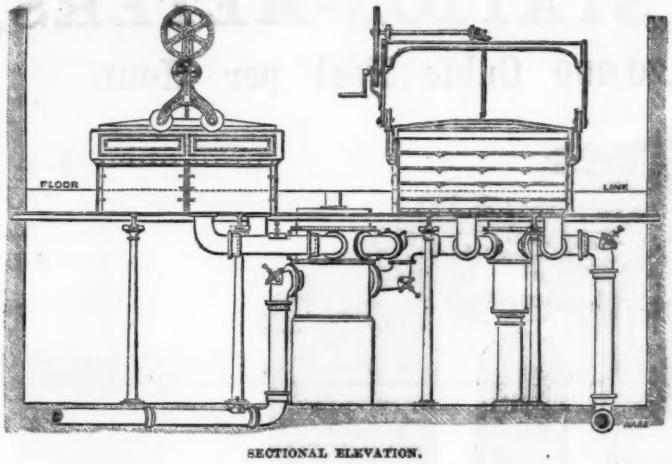


PLAN.



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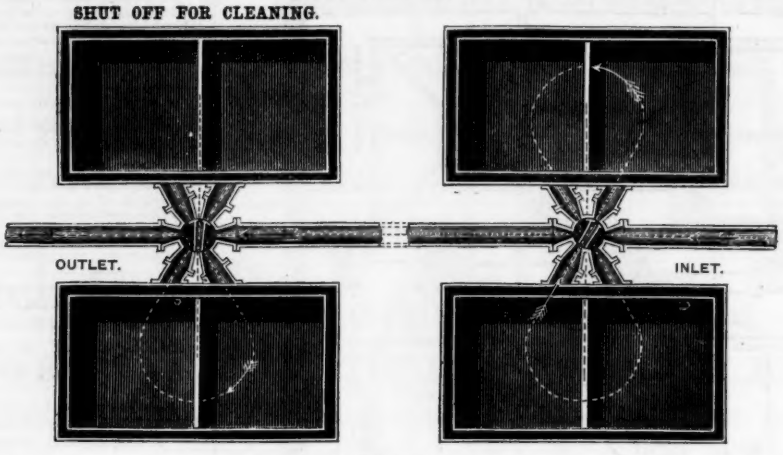

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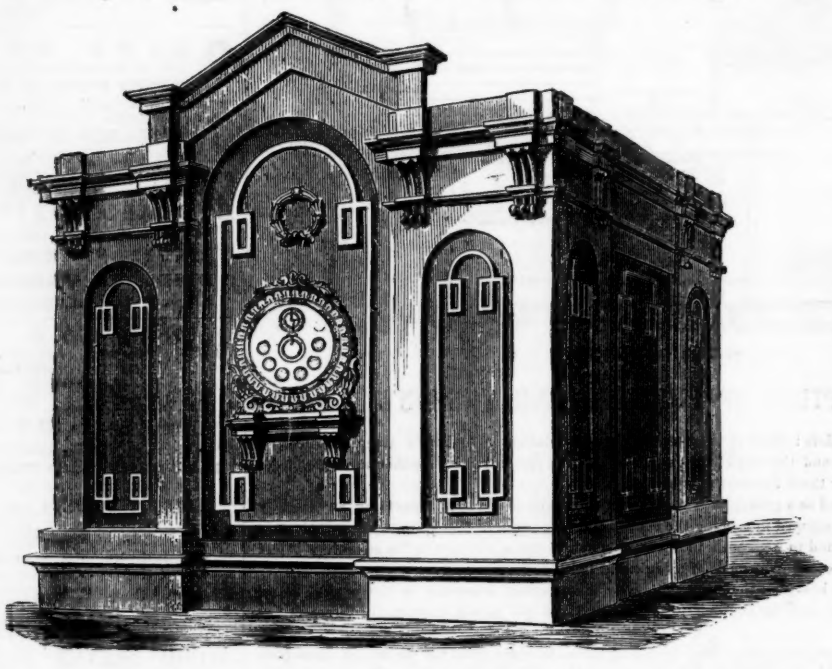

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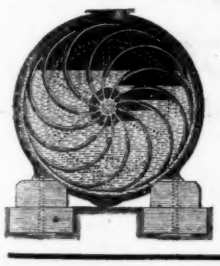

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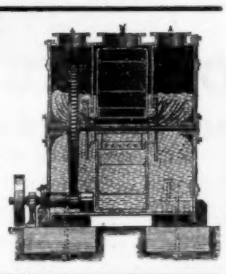

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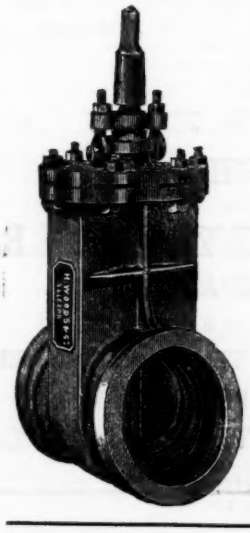

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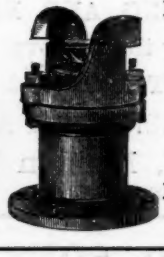

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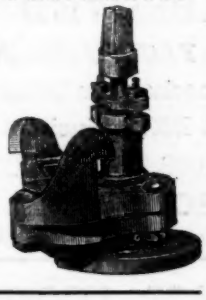

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donne avis:

Qu'en exécution d'une partie du système des travaux d'amélioration projetés, elle met en adjudication

LA CONCESSION

DE L'ECLAIRAGE AU GAZ ET AU PETROLE DE LA VILLE DE GALATZ.

Le concours aura lieu par offres cachetés, sur la base du cahier des charges apprové par le gouvernement roumain.

Le jour fixé pour le concours sera

JEUDI LE 30 JUIN, 1870, NOUV. STYLE.

Le cahier des charges, une esquisse du plan de la ville et les conditions du concours, seront à la disposition de ceux qui en feront la demande, à partir du 1er Mai prochain, et leur seront expédiés à l'adresse qu'ils indiqueront.

Les demandes devront être adressées par lettres affranchies au

MAIRE DE LA VILLE,

GALATZ, ROUMANIE.

ALFRED PENNY, Gas and Consulting ENGINEER,

WENLOCK IRON-WORKS,

21, WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, and T-pieces, &c., &c.

Plans, Specifications, and Estimates prepared.

D. GRANT & CO.,

GAS-METER MANUFACTURERS.

STATION-METERS ANY SIZE,

PHOTOMETERS, EXPERIMENTAL METERS, &c.

GAS-METER WORKS, CROSSCAUSEWAY, EDINBURGH.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

EDGE'S Patent for Removing the CARBONACEOUS INCRUSTATION from GAS-RETORTS.

For particulars and terms, apply to E. GODDARD, Sole Agent, Gas-Works, IPSWICH.

CATHELS'S Patent Ribbed Gas Main-PIPES cost but about 1d. to 2d. per yard (depending on the size) more than Plain Pipes, and ensure PERFECT GAS-TIGHT CONNEXIONS with the Service-Pipes.

Apply to Messrs. BEGGS & SON, 37, Southampton Street, Strand, LONDON.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

TO GAS COMPANIES & OTHERS.

THE PATENT ANTI-GALVANIC PAINT

Is recommended to all intending to Paint their Gasholders, Purifiers, &c., this season, as the most valuable PRESERVATIVE PAINT. It prevents and arrests all rust, will cover tar, will stand heat, and is not acted on by any gaseous exhalations. It is made ready for use.

For price, &c., apply to BRACE, BRACE, AND CO., 11, Red Lion Court, Fleet Street, LONDON, E.C.

HARRIS AND PEARSON,

STOURBRIDGE.

PROPRIETORS OF

BEST GLASS-HOUSE POT & CRUCIBLE CLAY.

MANUFACTURERS OF

FIRE-BRICKS, GAS-RETORTS, AND FIRE-CLAY GOODS

OF EVERY DESCRIPTION.

Orders of any magnitude, for home and exportation, executed with all possible despatch.

N.B.—A quantity of Retorts in stock.

Circulars, 15 in. and 16 in. Ovals, 20 in. by 14 in.

D's, 15×13, 16×12, 18×14, 20×16, 21×14, 24×14.

THORNELOE AND COMPANY,

34, LONDON WALL, CITY, E.C.,

GAS AND WATER ENGINEERS AND CONTRACTORS.

WHOLESALE DEALERS IN

Wrought-Iron Tubes and Fittings for Gas, Water, and Steam; Chandeliers, Pendants, Lamps, and Brackets; Plumbers Work, Water Closets, Pumps, &c.; Lead, Composition, Brass, and Copper Tubes.

Orders Supplied from Stock at the

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AGENTS FOR

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

Analyses by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

Description.	Cubic Feet of Gas per Ton of Coals.	Illuminating Power in Candles.	Coke per Ton of Coal used. Cwt.	Ash in Coke per Cent.	Sulphur in Coal per Cent.
Best Silkstone . .	10,900	17·0	12·8	2·6	1·7
Norfolk Silkstone . .	11,000	15·94	12·5	4·4	1·64
Silkstone Brights . .	11,500	14·5	12·6	7·4	1·85
Silkstone Nuts . .	10,800	15·85	12·66	6·0	0·69

NOTE.—The illuminating power of the Gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

FULLERTON, SON, & CO.,

GAS-METER MANUFACTURERS,

LONDON ROAD METER-WORKS EDINBURGH,

SOLE MANUFACTURERS OF

THE PATENT IMPROVED TIN-PLATE DRY METER,

WITH SPECIAL FACILITIES FOR ADJUSTING AND REPAIR,

The principal parts of the mechanism being accessible by the removal of a single screw.

GAS-METERS on the WET and DRY principles made in CAST-IRON and TIN-PLATE CASES.

STATION-METERS, GOVERNORS, EXPERIMENTAL & TEST METERS, GAS APPARATUS, &c.

LONDON AGENTS: THORNELOE & CO., 34, London Wall, City, E.C.,

Where Meters are supplied to order from Stock.

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

TANGYE BROTHERS & HOLMAN,

ENGINEERS, MACHINERY AGENTS, AND MANUFACTURERS,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.;

And BIRMINGHAM (TANGYE BROTHERS), CORNWALL WORKS, SOHO.

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS.

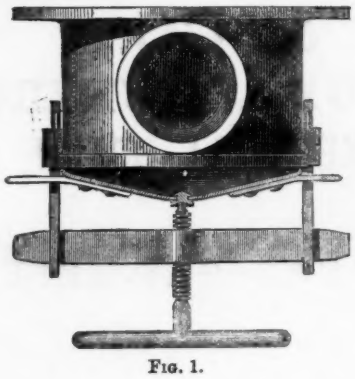

FIG. 1.

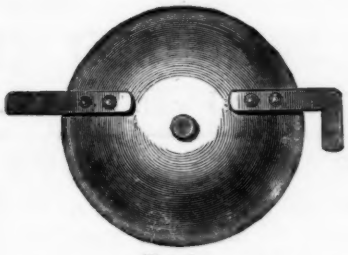

FIG. 2.

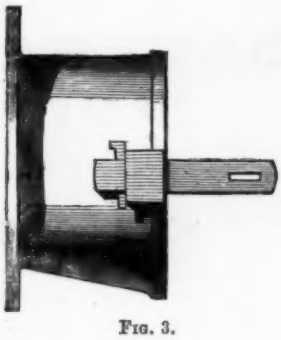

FIG. 3.

Several Hundreds in successful operation in various Gas-Works.

The expensive and cumbersome process of sealing the mouths of Gas-Retorts by means of luting the Lids with lime and other materials hitherto used for that purpose, is henceforth rendered unnecessary, and will be superseded by the very efficient method shown in the accompanying illustrations.

Fig. 1 shows a plan of a mouthpiece with Morton's Patent Lid in section. The mouthpiece is faced true, and the projecting circular edge or periphery of the lid is also turned true, and, by preference, of a semicircular section, so that the point of contact is reduced to a minimum; the convex form of the Lid rigidly sustains the force of the screw, which, by its central action, gives the Lid a uniform bearing, and effectually seals the mouth of the Retort.

Fig. 2 shows a front view of Morton's Patent Lid, which is stamped out of plate iron, having (in this case) ledges to rest on the lugs of the mouthpiece; these Lids, however, are more generally fitted to hinged cross-bars, by which means they remain suspended while the charge is withdrawn and the Retort charged, so that the damage done by throwing them about is entirely prevented.

The advantages obtained are—

1st. The sound sealing of the Retort during the whole time it is carbonizing the charge of coal, there being no jointing medium between the Lid and the mouthpiece.
2nd. The improved condition of the coke by the non-mixture of lime.
3rd. The Lid requires no preparation on the part of the stoker, beyond slightly scraping the surface to remove extraneous grit or dirt.
4th. The Lids are only about two-thirds the weight of the old form in general use, a Lid for a 16-inch mouthpiece weighing a little over 20 lbs.
5th. The Self-sealing Lid reduces labour, saves wear and tear, obviates all the inconvenience and discomfort consequent on the preparation of luting, and effects a great reduction in the working expenses. The cost attending the process of "luting" in several large gas-works, exceeds £1000 per annum, ranging in various works from 20s. to 35s. per mouthpiece.

It will be obvious that a round Lid is the most convenient and the cheapest form. D Retorts are adapted for round Lids, by carrying the bottoms down the necessary depth for that purpose, as shown in Fig 3. Some mouthpieces have been thus adapted, and are in use at the Chartered Gas-Works.

The following testimony speaks in favourable terms after ample and careful test:—

Burslem and Tunstall Gas Company, Longport, Staffordshire, Oct. 12, 1869.

Dear Sir,—In reply to your favour of the 9th inst., I have pleasure in stating that my admiration for your Patent Retort-Lid is most unqualified. I have 14 of them in use, and have tested them in the severest manner possible at these works, but without being able to detect the slightest defect. Yesterday the strap slipped off the exhauster, and a pressure of 13 inches was thus almost instantly thrown upon the Retorts, but although many of the luted Lids were leaking, not the slightest escape was observable from yours. I had anticipated that at least some greater degree of care would have been required in the scraping of the mouthpieces after the drawing of each charge, but even in this particular I find that labour has been reduced.

By every stoker on these works, as well as by myself, your Lids are regarded as a boon.

Please send me 30 more at your earliest convenience.

I am, &c., (Signed) HENRY WOODALL.

R. Morton, Esq.

Chartered Gas Company, Horseferry Road, Westminster, Sept. 15, 1869.

Dear Sir,—I have only lately returned to town, which is the reason I have not replied earlier to your inquiry.

I beg to say that I have had your Lids in use for upwards of two months, and during that time they have always kept a perfectly sound joint. I may add that where your lids are used only one set is required.

I remain, &c., (Signed) G. O. TREWBY.

R. Morton, Esq.

Chartered Gas Company, 146, Goswell Street, E.C., Oct. 20, 1869.

Dear Sir,—I have much pleasure in stating that, after some months trial of your Retort-Lids, I find them everything I could desire. I consider the plan a great improvement.

I am, dear sir, yours truly, (Signed) A. UPWARD.

R. Morton, Esq., London Gas Company.

These Lids are in successful use at the London Gas-Works, the Chartered Gas-Works, the Dublin Gas-Works, the Burslem and other Works, giving great satisfaction.

Application for Licences and other Information to be made to

TANGYE BROS. & HOLMAN, 10, Laurence Pountney Lane, London, E.C.

Sole Makers of Upward's Patent Safety Drilling Apparatus, Weston's Patent Differential Pulley Blocks, the "Special Steam-Pump," the Patent Duplex Lever Punch, &c.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c., &c.,

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

PATENT IMPROVED WET METER.

W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sales of Gas Act.

"It is well known that in Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow, the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the valve instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

Which W. P. and Co. pledge themselves to manufacture with the same quality of materials and workmanship as in their Wet Meter, thereby giving Gas Companies and others the advantage of procuring a first-rate Dry as well as a Wet Meter, which, hitherto, they have been unable to do.

STATION-METERS AND GOVERNORS,

Which can be seen at all the London Gas-Works; also at Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 7, 1870.

Notes upon Passing Events.

The time when the Derby Day has just passed is the proper time to discuss the evils of gambling. Gambling, in England of the present day, means betting, for that vice has swallowed up all others. From time immemorial Englishmen have been apt to challenge any opinion with a wager, and now the disease has so far extended that it is no longer an aristocratic or a plutocratic vice, but essentially the sport and the bane of the democracy. Parliament is loudly called upon to interfere with turf betting; and, although Lord Royston shakes his handsome head, and declares that "everything is for the best in the best possible of worlds," everybody knows that "there's nothing in it," and that as member for Cambridgeshire he is only speaking the sentiments of his Newmarket constituents. Mr. Home Secretary Bruce, who has never in his life had time for idle amusements, any more than his chief, Mr. Gladstone, takes a truly magisterial view of the subject. He is in a Cabinet not so completely identified with Tattersall's subscription-rooms as Lord Palmerston's, with Sir Robert Peel Secretary for Ireland. Then the idea of meddling with the amusements, honours, and profits of the members of the Jockey Club was too absurd! The fact is that peers and landed squires, as well as the sporting butterflies of the exchanges of London, Liverpool, and Manchester, might flourish and fade, win and lose "pots" in six figures, without the Legislature being the least troubled about that form of vice. Unfortunately penny postage, penny newspapers, telegraphs, and railways, have brought the machinery of gambling home to the humblest door with the perilous addition of secrecy. Formerly the turf was fairly divided between gentlemen and blacklegs. Now betting is a trade by which thousands live; every race is provided with an enclosed ring, and infested by men whose profession it is to lay against every horse named in the entries. Tens of thousands of copies of newspapers, lithographs, and circulars convey to every grade of society intelligence more or less authentic of the "market price" of every horse engaged in a race of the least importance. These public gambling-houses have been suppressed; so have gambling-clubs, like Crockford's and Bond's; so have gambling-tents on race-courses, so have lotteries; but the spirit exists, and has found vent in turf betting, especially by correspondence. Formerly the turf gambler was obliged to attend races, and was supposed to know something about the merit of the horses. Now there are tens of thousands who bet, scarcely knowing the difference between a mule and a horse, tempted only by the excitement of possible and easy gain. It is not exaggeration to say that in a quiet country town, in an eminently respectable family, it may be not only the groom who has his pound on the events of the Epsom week, but the cook and housemaid, the butcher's boy who brings the meat to the door, the silent clerk who sits like a Stoic behind the desk, the doctor who comes in his gig, and even the clergyman who gives such edifying discourses, may each and all have a correspondence with a London sporting authority, and a little venture. Such, in fact, was the evidence found by the police when they made a raid some time back on what were called the "great list houses." What the Home Secretary is supposed to contemplate by his Bill is not to put down turf gambling—that is impossible—but to make it difficult. Already betting at public-houses, betting-offices, and the epistolary betting, conducted by advertising agents, have been made illegal. At Epsom, for the first time this last week, the peripatetic list-desks have been suppressed. If, then, it be made illegal not only to advertise the state of the odds, but to report it in the racing notes of newspapers, a void of ignorance will be created which, if not "bliss," will at any rate be wholesome. The object should be to make it as difficult as possible for any one to bet on a race without going to a race-course, and even there to abolish all the profitable facilities which professionable gamblers now obtain at rent, and on terms which support many race-courses. As to regulating races, although they have long ceased to have anything to do with the improvement of the breed of horses, that is certainly beyond the useful functions of an English Parliament. Eventually the Jockey Club may be shamed into discountenancing those races of infantine colts and fillies, which are the worst form of cruelty to animals, and those handicaps which are at the same time the glory of Admiral Rous and the foundation of the most corrupt form of gambling. It is useless to make laws that cannot be enforced. Those that require the common informer are sometimes inevitable evils, but should be as much as possible avoided. The betting question, amongst others, points strongly to the need of a system of public prosecution; this more than one recent case in the police court has proved. We have an example, not to be servilely followed, in the Scotch Procurator Fiscal. Nothing can be more cumbrous than the want of system which leaves the conviction of offenders either to the efforts and expense of private individuals, or to the overworked Home Office, or to the representation of the police, or to the zeal of officers of private societies. One society professes to prevent vice; another to protect women and children, another animals, from cruelty. These societies consist of subscribers who do not interfere, and are actively managed by paid officials, whose zeal soon settles into the channels where the greatest sensation can be created, and the largest subscriptions elicited. No doubt they fill a much-needed gap in the administration of justice; but the system is false, and often brings justice into contempt. It will be too often found that, whatever may have been the purity of the motives of the original founders of the Philanthropic Prosecuting Society, it ends in a handsome set of chambers, a staff of clerks, an unctuous and unscrupulous secretary, a briefless barrister, combining in his own person the incongruous offices of attorney, spy, and advocate, and a following of professional witnesses, with blank briefs always ready to fill up with evidence. If it is worth while to prosecute offenders against the law, it is worth while to have official machinery for carrying out the prosecutions. These amateur prosecutors or their inferior agents cultivate a good deal of evidence that is very like bearing false witness.

Although the average Englishman prides himself on being as unlike a Frenchman as possible, no great political movement has ever taken place in France without producing its effect in England. Much more must it be the case as regards Ireland. A great measure has been rolled through the House of Commons, with nearly universal assent to its principles, for completely altering the relations of landlord and tenant in Ireland. The "fitting"

having been completed in the House of Commons, the House of Lords will give the "finish" to the machinery. Although the conditions of the two countries are so different, it is impossible that the example should produce an effect amongst the English tenantry by showing what may be gained from landlords by pressure. The average Irish farmer, or cultivator, is a pauper who lives from hand to mouth on his sweat and his land, afraid to own if close economy and toil have enabled him to make savings. The average English farmer is a man of capital, who, in return for land and the fixed appliances in building drains and fences for cultivation, agrees to keep the soil unexhausted, to pay a moderate rent, to preserve the game for his landlord's use, and by implication to vote as his landlord wishes. But farmers are every year grumbling more and more loudly against the modern system of game preserving. They claim to have hares kept down, and rabbits placed in the same category as rats, to be destroyed as "vermin" at the tenant's pleasure. One of the few landlords who grants leases so terms rabbits, classing them with rats. The change in the mode of conducting parliamentary elections will shortly entirely release tenant farmers from the control of landlords and agents; if, in addition to a change in the game laws in favour of the tenant, and the loss of political influence in proportion to the number of his tenants, the landlord is asked for leases or compensation for unexhausted improvements, as he probably will be by the rising generation of tenants, a rise of rents will immediately follow, moderately estimated at half a crown an acre—on great noblemen's estates probably nearer ten shillings. The proof that farms are under-let is to be found in the unquestionable fact that a farmer who has received a promise of a farm for his son from any of the great territorial English noblemen, always talks of it in the same tone as if he had inherited a handsome legacy, or received some well-paid appointment under Government. Examine closely the condition of farmers in England who hold their land at will under a six months notice, with no covenant for payment for unexhausted improvements—a very poor compensation for disturbance at best; bound to preserve game for the landlord, or the tenants to whom he may let the shooting; and in nine cases out of ten, nay, in ninety-nine cases out of a hundred, you will find that in rent and conditions as to repairs he has carefully insured himself. The true grievance is not with tenants-at-will farming under a vicious system to their own profit, but against the public. It is the interest of the public that every farm should be cultivated in the best manner—that all the produce should be got out of it that the expenditure of capital in labour, manures, and stock will produce, and that at the end of the year the land should not be worn out and exhausted, but in rather better condition than at the commencement of the tenancy. It is a fact that, no matter what the terms of the tenancy may be, no farmer can practise good husbandry without laying out his system for at least five or, better still, seven years. Now, as a rule, no tenant-at-will can cultivate as he would with security of tenure. It is, therefore, for the public interest that in England, as in Ireland, security of tenure, with covenants for good husbandry, should be universal. In England we hold it to be absolutely vicious that a tenant should sink his capital in buildings, fences, drains, or other landlord's work; but that, paying a per centage in any extra work of that kind, he should invest his capital in live stock and the stuff that grows the greatest crops. We cannot tell when an appeal to Parliament may be made, the time seems scarcely ripe; but, except on very great hereditary estates, we expect to find landlords of the next generation more exacting in rent and more liberal in the conditions of tenure, for tenancy at will is a remnant of patriarchal barbarism.

For the same reasons, the agitation against the game-preserving system is now becoming, for the first time, formidable. Mr. Taylor had no great success in his rambling speech of rash assertions, because every one knows that, like the Puritans who put down bear-baiting, not out of regard for the bear, but because it amused the Royalists, it is not the game, but the country gentlemen, that Mr. Taylor wants to abolish. Still a real grievance exists, not to be puffed away by Mr. Single-speech Gerard Sturt's happy effort. Mr. Sturt's receipt for making the preservation of game no nuisance is perfect but not practical. He lives a long way from any great population; he rears four thousand pheasants every year, but he keeps hares and rabbits down so as not to ravage his farmers crops; he makes all the labourers on his estate comfortable with good cottages, with gardens and allotments; finally, he does *not* let his game to any one, or sell it, but shoots it with his friends, and gives it away. A system exactly the reverse extensively prevails. One set of gigantic preservers devote their minds and their money to raising waggon-loads of game, in which ground game—the most mischievous—has a large share. Two or three times in the year a grand slaughter, duly chronicled in the county papers, takes place. The results are packed off to the London poulterer; indeed, in no other way could so much dead meat be disposed of. For the rest of the year the gamekeeper has undisputed sway, ruling with a rod of iron over every tenant-at-will, and, of course, over every labourer—labourers blessed with neither the gardens nor the cottages of Mr. Sturt's favoured hinds. These landlords, as before stated, pay their tenants for their submission. But the public pays in the costs of prosecutions and imprisonment, fostered by the temptation of hares more plentiful than sheep, pheasants, or tame or barn-door fowl, and rabbits swarming like rats in every hedgerow. Poachers are doubtless professional thieves, but hundreds of labourers are sent to the bad by a first conviction for poaching. Another and more active element of evil arising out of the present condition of the game laws is the trade in raising and letting game. Nothing pays better in any district within reach of a great town than to stock an estate with game, and let it. The people who come from towns to enjoy rented game without owning a foot of land in the district, have no responsibilities. They have only one object—to shoot as much game in as short a time as possible. They zealously foster the pests of the farm, and shoot every cat and cur in the neighbourhood. Wealth and taste for shooting grow together. Money is no object, so with the greatest zeal, game, and poachers who live on game, are bred, fed, and disposed of at the cost of the country. This is a sort of thing that will not do in these days. But there is no more probability of the abolition of field sports than of a Parliament of Puritans.

While there is so much discussion on the means of turning to account the manurial resources of our water-closets and sewers, and consequently on the respective values of solid and liquid manure in our country towns and villages, we find something worth quoting from Dr. A. Voelcker's tour and report on the agriculture of Belgium, published in the last number of the "Journal of the Royal Agricultural Society:"—

It is almost impossible to infuse into a body of English agricultural labourers (or Irish peasant farmers) the same amount of interest as is displayed by all classes of Belgians in farmyard manure. Its collection, preservation, and application are constant topics of conversation and subjects of debate. It is continually either "vett," in Flemish, or "fumier," in French, upon which the argument has turned; and, as an actual fact, it has a most important bearing at once on the greatest excellency and the greatest defect in Flemish farming. Throughout the land district it is carefully stored in a building similar to our old-fashioned barns, but with a much lower roof, while the large and better farmers in the Polders, and the heavy land districts of West Flanders, prefer to have well-constructed buildings similar to the skeleton-barns of Cheshire. The latter plan seemed to us by far the more preferable; and it is not so expensive, and as the manure is always trodden by calves and heifers, there is more ventilation for them, while the protection is not less effective. But in the district of *la petite* culture the supposed superiority of the manure is more considered than the cost of its attainment, therefore a close building is preferred for storing the manure, in spite of the injury done to the poor panting beasts, who wearily tramp about in search of an exit from an atmosphere of ammonia. The drainings from the manure-house are carefully collected in tanks, as also are all other descriptions of liquid. The steading on one farm of 60 acres was furnished with the following tanks, each fitted with a separate pump:—

1. Receiving liquid refuse from the scullery.
2. Receiving liquid manure from the stables and cow-sheds.
3. Receiving the drains from the covered midden; these are afterwards used for washing out the stables, &c., and then go into No. 2.
4. Receiving the overflow of the drainings, and any excess of water in rainy weather; this is used on the meadows.

The above is a fair representative of the system adopted, and of the extraordinary anxiety with which the Flemish farmer attempts to save every article of liquid manure; but we were heterodox enough to think, that respecting some portion at least of these appliances, "*le jeu n'en vaut pas la chandelle.*" Under good management dung loses none of its essential fertilizing constituents, and neither sun nor wind expels any volatile ammonia compounds from it. It appears, therefore, quite unnecessary to keep dung in closed buildings. In localities where much rain falls; and a sufficient amount of litter cannot be used to absorb the liquid portion of the manure, it is advisable to have the manure-steading roofed in, and the sides open, but where sufficient litter can be spared in the making of the manure to retain, even in rainy weather, the liquid portion, it is even unnecessary to put a roof over the dung-pit. No loss in fertilizing matter is experienced when the dung is carted and spread upon the field as soon as it is possible to do so after it is produced.

The Belgian system of keeping farmyard manure in closed buildings for a considerable length of time, the abundant use of water in its preparation, and the partial separation into liquid and solid dung, does not commend itself to our view as worthy of imitation.

This system entails unnecessary expense in the construction of closed buildings, tanks, and labour for pumping, carting, and distributing separately the liquid and solid manure, and affords a far less effectual safeguard against loss in fertilizing matter than the plan of carting and spreading the manure on the fields so soon as it can be done after it comes from the stables or the cow-sheds; for however well liquid-manure tanks may have been constructed, it is next to impossible to confine in them entirely large quantities of liquids, and it is by the draining away of the liquid, the most valuable portion of the manure, and not by evaporating to the air or sun, that farmyard manure sustains any loss in fertilizing matter.

On farms where fattening stock is kept, the best plan of making and keeping manure unquestionably is to make it in boxes, a plan which is rarely seen in operation in Belgium. The Belgian farmer, as a rule, is anxious to obtain as much liquid manure as possible, and for this reason rather invites than prevents the rains which fall from the unguttered roofs of the farm-buildings to find their way into the midden.

The Belgian system of farming is instructive chiefly as an example of extraordinary industry and thrift. Under *la petite culture* many people are supported on the farm who consent to live a very hard life. The wages of the hired labourers are miserably low. The live-stock is insignificant, of poor breed, and seldom fat, and the net produce for sale is very small, as compared with average English and Scotch farms; indeed, under peasant cultivation mutton would be half a crown a pound, and fat beef a

greater rarity than venison. There would be no agricultural progress, no use of machinery, no improvement of stock—all of which are due to this country. But, on the other hand, there are many districts where small holdings within the reach of a frugal peasant may be advantageously encouraged. The bane is in a dead level of peasant proprietors, with no greater man amongst them than the priest and the policeman.

The Corporation of London have added one to their triumphs of resistance, and defeated the only plan that could have improved the dangerous crossing of Mansion House Street. There is no more to be said or worth saying, as this is probably the last time that the Council will have a chance of choosing between constructive and obstructive policy. The Lord Mayor made an excellent speech for the Corporation, of which he is the splendid annual, with one fault only, and that of date. If Lord Mayor Besley could have made the speech in which he denounced the attempt of "small members of Parliament" to remodel a very ancient institution, forty years ago, in defence of the old English constitution, then on its trial, he would have had a large and sympathizing party in the public and the press; but the claim of the Corporation of London to remain unchanged after forty years of reform in every institution, from the House of Lords and the Church of England and Ireland to the Small Debts Court, will scarcely hold water or gather strength from its last exploit.

The daily press are very angry with Mr. Craufurd for excluding them from the debate on the Contagious Diseases Act. We think Mr. Craufurd was right in exercising this rarely used privilege, not to save the ears of the two nasty-minded women who wished to stay in the ladies gallery: they were, no doubt, of the sort who remain in court after the judge has said all *modest* women will withdraw. For once it was well that on such a subject men with special information should speak the whole truth within their knowledge. Now there are, strange as it may sound to strong-minded women, modest men; indeed, this is the reason that the meetings of sensation and declamation held by women on the subject of the repeal of the Contagious Diseases Act have met no opposition. To argue on such a subject is to bring out facts that no decent woman under sixty ought to hear. The committee which took evidence many years ago sat in secret to receive evidence of the horrors of a purely male criminal population. The precedent is a fair one, and ought to be followed if the effect of restriction on the propagation of the venereal disease is to be fairly investigated.

Mr. Ayrton is really having very hard times. Of all men in the House, out of office, he would most keenly have enjoyed opposing the Kensington Road Bill. The scheme is the scheme of Henry Cole, C.B. The patrons of the Albert Hall of Omni-Science are too illustrious to be named, and press upon the Ministers with irresistible force. The funds for the hall itself were raised by a system of touting that would have done credit to a Manchester bagman, and the House of Commons knows it and does not like it. The plan itself will improve the road and the park, but the principle of bit by bit encroachment is naturally displeasing to the gentlemen who hold the purse-strings of the nation, so they oppose and worry Mr. Ayrton, and thus pay him for the superior airs of purity and independence in which he once indulged. But the First Commissioner has a good case, if he only knew it. He might take the bull by the horns, and deny the beauty of the trees about to be destroyed. Mr. Robinson tells us, in his "Parks and Gardens," that elms are a failure in London on London clay. Eyesight supports his assertion. Scores of trees in Hyde Park are dying at the top. A replanting scheme would cover all the acquisitiveness of the South Kensington Museum Machiavels. We wish some Member of Parliament would compare the obstinate resistance of Crown authorities to the improvement of the Park Lane exit in Piccadilly with the pertinacity with which this Albertine decoration is pursued.

Mr. Baxter, at the Admiralty, is another superior person, who is finding out that to be right is not to be happy, unless you have mentally the skin of a rhinoceros. The opposition, who have lost their places and the places they hoped to bestow on friends and relations, have that credulity, in believing the most wicked things of the Ministers, that the Premier's party will enjoy when Mr. Gladstone and Mr. Childers are out of office. Mr. Baxter is intent on reforming not only the corruption but the mistakes and stupidity of centuries. He is on the right track, and has done a great deal, but he must inevitably make mistakes while he is feeling his way to a sound system. There is this comfort for his opponents: every official system must fail after a certain number of years, and again require fresh investigation and active reformers. But Mr. Baxter has done good service by resisting the farce of sealed tenders. Under the tender system the grossest jobs are easily perpetrated. There are no more remarkable examples of the farce of tenders than in those for the printing of parliamentary papers, or for the supply of printing and stationery to the Corporation of London; or, to take a single instance, the tenders for the catalogue of the last Exhibition at South Kensington. The Government will pursue the surest economy in letting the trade know at what price articles of large consumption are taken. After all, it will do such people as Mr. Ayrton and Mr. Baxter no harm to feel the responsibilities and penalties of office.

WATER ANALYSIS.*

The publication of a second edition of this work, which, on its first appearance, provoked a good deal of controversy, may be taken as evidence that the system of analysis it recommends has been well studied, if not generally adopted. The most original and important part of the authors process—that for the determination of nitrogenous organic matters in water—has, we believe, been very generally accepted by chemists as easy of execution, and capable of giving fairly accurate results, no process yet devised probably giving us a perfectly exact estimation of those matters.

In order to determine whether a given water is or is not fit for domestic use, it is not necessary to have a complete analysis of the water. It is generally admitted that a very hard water is objectionable, and that a large proportion of saline, other than hardening, ingredients renders a water unfit for general consumption. It is further universally conceded that an excessive proportion of nitrogenous organic matter is prejudicial to health, while the products of the decomposition and oxidation of these matters are at all events calculated to render the character of a water suspicious. So much being granted, the examination of a water for sanitary purposes may be confined to a few points. We require to know the total solid residue; the hardness, temporary and permanent; the chlorine, as indicative of chloride of sodium, and therefore of possible sewage contamination; the ammonia and organic matter; nitrates and nitrites; and lastly, the metals to be especially looked for in certain localities. Accordingly, we have in this book chapters devoted to each of these determinations. They are preceded in this edition by a chapter describing a method of making a "preliminary examination" of a water, which will take but little time, and afford useful information to guide the analyst in his further proceedings; and, indeed, in some cases sufficient evidence on which to condemn a water without further examination.

In the space which we can devote to this notice it is impossible to enter upon any critical examination of the processes recommended by the authors; and, indeed, on only one point is lengthened criticism called for. As to the best methods of determining organic matter, chemists do, and will, we fear, for many years to come, differ considerably. Some still advocate the process by means of permanganate of potash as at once the most easy, and as sufficiently accurate for all practical purposes; and we are strongly inclined to agree with them, while freely granting that it may not give perfectly accurate results. All we would contend for is, that it does give fairly exact indications of organic matter in its most objectionable forms. The authors of this book estimate organic matter by ascertaining how much ammonia is formed when such matter is decomposed by the action of permanganate of potash and caustic potash. A similar objection to that made to the permanganate test has been brought against this method—viz., that all the organic matters which may possibly be found in waters are not broken up with equal facility by the reagents. But the same answer may again be made, that beyond doubt the most obnoxious forms of organic matter are readily broken up, and the amount of ammonia found is a fairly accurate measure of the quantity of such matter present in the water. The only other mode we need allude to is that followed by Dr. Frankland, who makes an ultimate analysis of the organic matter by combustion. This is a method which can only succeed in the hands of most expert analysts; and even with these the margin of possible error, from a variety of circumstances, is so great that, except in extreme cases, the accuracy of the result must be open to the gravest suspicion. The value of this method is temperately discussed in an appendix to the work we notice, and to that we must refer the reader anxious for further information on the matter.

As the book is written for—and, for the most part, can only be of use to—skilled chemists, we need not further allude to the processes of analysis it describes; but we may commend the "preliminary examination" to the notice of engineers and others who may be engaged in the selection of a water supply, as not requiring much chemical knowledge for its execution, and yet affording sufficient information to enable them to decide at all events against a water. The further examination can only be conducted by skilled hands.

In conclusion, we may mention the curious and unexpected results arrived at by the authors from an examination of the water

* *A Practical Treatise on the Examination of Potable Waters.* By J. A. Wanklyn, M.R.C.S., and E. T. Chapman. Second edition. Edited by E. T. Chapman. London: Trübner and Co. 1870.

supply of several towns during the summer of 1868. It was that the water of Manchester, Edinburgh, and Glasgow, the Thames, and New River, all contained substantially the same amount of albumenoid organic matter. "It would seem," they say, "as if "there were natural processes at work tending to equalize the "quality of natural water that is freely exposed to air and light."

Passing for a moment from the chemistry of water, of which we may be said now to know enough, we may just remark that what is further required is a full and fair inquiry as to the influence of a water supply on health. Whether, considering the diverse conditions under which our populations exist, it would be possible to arrive at any satisfactory conclusion as to the influence the water supply may exert in promoting the healthiness or unhealthiness of a locality we cannot say, but most certainly the inquiry should be made; and such an investigation, undertaken by some one untrammelled by preconceived notions as to the origin and spread of disease, and unbiassed in favour of particular modes of examination, could only lead to useful results.

Circular to Gas Companies.

The Gas and Water Facilities Bill has been read a first time in the House of Lords, and stands for the second reading on Monday, the 13th inst. It will be seen from our report of the last proceedings in the House of Commons, that the Government intend to propose an amendment enabling the Queen in Council to alter at will the department charged with the duty of granting provisional orders. The expediency of such orders being granted sometimes by the Home Office and sometimes by the Board of Trade may well be doubted, and probably the common sense of the Lords will see the advantage of having one "central "authority" to decide on all these questions.

A letter from Mr. Bower, which will be found in another place, explains the circumstances under which Mr. Shaw Lefevre's amendment was made, giving the Board of Trade power to dispense with the consent of a local authority if they see fit. As the bill originally stood, it left an existing company or private owner wishing for the protection of an order completely at the mercy of a local authority, who might withhold their consent as a means of extortion. The amendment which Mr. Bower suggested was not at all unreasonable, and if it had been adopted would have greatly simplified the proceedings of the Board of Trade. As it now stands, the Bill may possibly give the Board some troublesome work, which might well have been avoided. It might still be possible to get the amendment introduced in the House of Lords; but in any case Mr. Bower deserves the thanks of gas proprietors for his prompt intervention on their behalf.

A Bill filed by the Attorney-General, at the instance of two ratepayers of St. Helen's (shareholders in the gas company), for an injunction to restrain the Corporation of that borough from applying any of the borough fund raised by rate to paying the cost of opposing a Bill promoted by the St. Helen's Gas Company, has been dismissed with costs by Vice-Chancellor Stuart, without calling upon the counsel of the Corporation for a reply. There are, however, circumstances in this case differing from any yet presented to a court of equity, for, in the Act of Incorporation obtained last year, a clause was inserted giving the Corporation power to raise £100,000 to purchase the gas undertaking by agreement, and Vice-Chancellor Stuart holds that the Corporation are perfectly justified in expending borough funds for the purpose of opposing a Bill which, if passed, would make the gas undertaking worth a great deal more than this £100,000. The object of the opposition was originally to prevent an extension of the district; and having partially failed in this, it is now directed towards obtaining a reduction in the price of gas to 3s. 6d. per 1000 feet, thus endeavouring to diminish the value of the undertaking with the ultimate view of purchasing on cheaper terms.

The Dundee Gas Commissioners have published their accounts for the year ending April 30, 1870, a portion of which we print in another column. The accounts show that the commissioners have made a profit of £3638 10s. 3d., after paying £8662 10s. in annuities to the shareholders of the companies, and appropriating £1000 as a sinking-fund, and £1000 to "depreciation and "capital expenditure account." The gas-rental, at 4s. 9d. per 1000 feet, amounted to £35,686 17s. 2d., and the meter-rents to £1770 13s. 11d. The gross cost of the Act authorizing the purchase of the gas companies undertakings, and of the arbitration following thereon, amount to £37,532 15s. 1d., of which £9435 5s. 7d. were the costs of the two companies allowed against the commissioners. The net profits from the 11th of November, 1868, when they entered upon the works, to April 30, 1869, are stated to have been £4035 1s. 2d.; but it must be borne in mind that the price of gas was then 5s. 4d. per 1000 cubic feet.

A writer in the *Hereford Journal* draws attention to an alleged imposition which the gas company of that city are attempting to practise on such of their consumers as are owners of meters, by giving them notice that they must have their meters stamped, or replaced with new and stamped meters, to comply with the Sales of Gas Act, before October 13. The writer seems to be ignorant of the fact that Hereford is one of the cities or boroughs which adopted the Act within the prescribed time, and never provided the means of carrying it into effect, and hence he supposes the Act has no operation in the city. In this belief he is, however, in error; for, as we pointed out in the paragraph he quotes, the failure to provide the apparatus necessary for carrying the Act into effect makes no difference whatever in the obligation to discontinue the use of unstamped meters after the prescribed time, and the sooner the Hereford public are undeceived, the sooner they will put themselves in a condition to receive an uninterrupted supply of gas, notwithstanding the neglect of their Corporation to appoint the proper machinery for carrying out the purposes of the Act.

In the *American Gaslight Journal* for April 2, Mr. Farmer criticizes the letter of Mr. Hunt which appeared in the Journal of Gas Lighting for March 1. The criticisms do not amount to very much; but an attempt is made to show that Mr. Hunt was too anxious to disprove the theorem. Mr. Farmer's conclusion is that the application of his theorem in the experiments proves that the proper consumption for the burners and gases employed by Mr. Hunt is 4·50 cubic feet, and the farther we get up or down from this quantity the greater will be the error in the results. He adds that every gas and every degree of consumption will require a suitable burner if a perfect combustion and luminous development is required, an opinion which may stimulate gas engineers in their search for other than photometrical means of determining the quality of a gas.

It may be worth mentioning that a claimant for priority of discovery of the new rule has been found in the person of Mr. H. H. Edgerton, superintendent of the Fort Wayne Gas Company, who does not, however, dispute the originality of Mr. Farmer's discovery. That gentleman also admits that the new mode of reduction is not capable of application to *extreme* variations in the rate of consumption, but he contends that it does answer practically, within certain reasonable limits, to make observations agree. For instance, he states, by using a holder containing an unvarying quality of gas, and burning the same candle during four or five consecutive observations, with a variance from the normal of, say, from 4·8 to 5·3 feet of gas, and 116 to 130 grains for the candle, the maximum difference is 0·5 of a candle, and the variance from a mean less than 0·25 of a candle. And such being the case, he argues that the new mode of calculation is the proper one within those limits. We may add that some additional experiments, published by Mr. Farmer, go to show that the illuminating power of a rich gas is greatly under-estimated, when the calculation from smaller consumptions to the normal standard of five feet is made by the simple rule of three.

A supplemental sheet accompanies this number, containing the sixth of the series of drawings of the new Chartered Gas-Works at Beckton.

Communicated Article.

SOME FURTHER EXPERIMENTS ON THE RATIO OF INCREASE OF THE ILLUMINATING POWER OF COAL GAS.

By Charles Hunt, F.C.S.

As a starting-point in the consideration of this question, it seems desirable to know what amount of uniformity there is in the illuminating value at different rates of consumption with different burners. On the one hand, a uniformity of results would serve as a guide to the ratio of increase; on the other hand, an absence of uniformity would infer certain conditions in the burner affecting such ratio, and until these conditions are satisfied or removed no definite conclusion can be arrived at.

Taking this view of the matter, I first subjected three Argands' being those most in use at the present time, to a series of trials with gas of as nearly as possible the same quality. The third column in the following table is calculated downwards, from the highest proportionate value in each case:—

No. 1.—Sugg's "London," 6-inch Chimney. Initial Pressure = 9/10ths; Standard of Comparison, a "London" Burner, consuming 4·906 Cubic Feet per Hour = 14·93 Candles.

Consumption per Hour. Cubic Feet.	Illuminating Value in Sperm Candles.	Illuminating Value, calculated by Rule of Three.	Difference per Cent. between Real and Calculated Value.
5·964	19·39		
5·526	17·14	17·96	4·78
5·208	15·91	16·93	6·41
4·992	14·94	16·23	8·63
4·576	13·36	14·87	11·30
3·990	8·98	12·97	44·43
3·528	6·12	11·47	87·41
3·030	3·28	9·85	200·30
2·472	1·37	8·03	486·13
2·004	0·47	6·51	1285·10

No. 2.—French Bengel, 8-inch Chimney. Initial Pressure = 9/10ths; Standard of Comparison = 15·11 Candles.

Consumption per Hour. Cubic Feet.	Illuminating Value in Sperm Candles.	Illuminating Value, calculated by Rule of Three.	Difference per Cent. between Real and Calculated Value.
5·248	15 79		
4·488	13·25	13·50	1·88
4·050	11·44	12·18	6·46
3·540	8·72	10·65	22·13
3·072	6·27	9·24	47·36
2·580	4·00	7·76	94·00
2·154	2·46	6·48	163·41
1·710	1·04	5·14	394·23
1·542	0·66	4·63	601·51

No. 3.—15-hole Standard Argand, 7-in. Chimney. Initial Pressure = 9/10ths; Standard of Comparison = 15·40 Candles.

Consumption per Hour. Cubic Feet.	Illuminating Value in Sperm Candles.	Illuminating Value, calculated by Rule of Three.	Difference per Cent. between Real and Calculated Value.
5·904	17·54		
5·580	16·46	16·57	0·66
4·872	13·41	14·47	7·90
3·924	9·55	11·65	21·99
3·408	7·57	10·12	33·68
2·718	3·93	8·07	105·34
1·710	0·95	5·07	433·68
1 482	0·49	4·40	797·96

The want of uniformity in these results, as shown in the fourth column, is so marked that it is quite evident no theorem accounting for the ratio can be built upon them. We have to look, then, to the burners for a solution of the problem.

One distinctive feature in the Argand burner is its two currents of air, the one acting internally upon the flame, and the other externally. It is well known that the illuminating power of a gas-flame is greatly dependent upon the due regulation of the supply of air, it being possible to admit so much as to render the flame quite useless for illuminating purposes, as in the Bunsen burner. It is also known that the height of the glass chimney has a sensible effect upon the illuminating power, this having been pointed out in 1861 by MM. Audouin and Bérard, and more recently by other observers in this country. These two facts side by side point to the conclusion that this influence of the chimney over the illuminating power is due to its effect upon the supply of air, for by increasing the height you increase the draught. Whether the air in such a case acts as in the Bunsen burner, by means of its oxygen, or whether the sharper draught merely carries up a portion of the carbon unconsumed, does not affect the question at issue.

The following experiments show the effect of *decreasing* the height of the chimney in the case of two of the burners:—

No. 4.—Sugg's "London." Initial Pressure, 9/10ths; Standard of Comparison = 14·93 Candles.

Height of Chimney.	Consumption per Hour. Cubic Feet.	Illuminating Value in Sperm Candles.	Illuminating Value calculated by Rule of Three.	Difference per Cent. between Real and Calculated Value.
6 in. ..	5·208 ..	15·91 ..	16·93 ..	6·41
5½ in. ..	5·166 ..	16·63 ..	16·74 ..	0·66
6 in. ..	4·992 ..	14·94 ..	16·23 ..	8·63
4¾ in. ..	4·992 ..	15·93 ..	16·23 ..	1·89
6 in. ..	4·576 ..	13·36 ..	14·87 ..	11·30
4½ in. ..	4·584 ..	14·60 ..	14·90 ..	2·05
6 in. ..	3·528 ..	6·12 ..	11·47 ..	87·41
3 in. ..	3·528 ..	10·52 ..	11·47 ..	9·03

No. 5.—15-hole Standard Argand, Initial Pressure, 9/10ths; Standard of Comparison = 15·40 Candles.

Height of Chimney.	Consumption per Hour. Cubic Feet.	Illuminating Value in Sperm Candles.	Illuminating Value calculated by Rule of Three.	Difference per Cent. between Real and Calculated Value.
7 in. ..	4·872 ..	13·41 ..	14·47 ..	7·90
5½ in. ..	4·872 ..	13·99 ..	14·47 ..	3·36
7 in. ..	3·924 ..	9·55 ..	11·65 ..	21·99
4¼ in. ..	3·876 ..	10·41 ..	11·51 ..	10·56
7 in. ..	3·408 ..	7·57 ..	10·12 ..	33·68
3¾ in. ..	3·348 ..	8·48 ..	9·94 ..	17·22

Here we see that by the simple expedient of shortening the chimneys according to the consumption, the difference between the real and the estimated value in one case almost entirely disappears, and in the other is reduced one-half. With a consumption approximating to 5 feet per hour, the "London" burner gives about 6 per cent. more light with a 4¾-inch or 5½-inch than with a 6-inch chimney, an increase not to be despised in photometrical observations.

With smaller consumptions, and with chimneys of different diameters, the results are still more remarkable.

No. 6.—Standard of Comparison = 14·93 Candles; Initial Pressure in each case, 9/10ths.

Name of Burner.	Consumption per Hour. Cubic Feet.	Illuminating Value in Sp. Candles.	Difference in Sperm Candles.	Difference per Cent. in favour of Smaller Chimney.
French Bengel, 8-in. chimney and cone . .	1·482 ..	0·567		
Do., 1¾-in. chimney, 1¼-in. diameter, and cone . .	1·452 ..	1·970 ..	1·403 ..	247·44
French Bengel, 8-in. chimney and cone . .	2·820 ..	5·046		
Do., 4½-in chimney, 1¾-in. diameter, and cone . .	2·796 ..	7·614 ..	2·568 ..	50·89
Sugg's "London," 6-in. chimney and cone . .	1·410 ..	0·144		
Do., 1¾-in. chimney, 1¼-in. diameter, without cone.	1·386 ..	1·240 ..	1·096 ..	761·11

I have also found, in certain cases, that a contraction of the central aperture increases the illuminating power to a considerable extent.

Finding that the highest rate of consumption fairly obtainable from each burner gave the greatest proportionate illuminating value, I was desirous of ascertaining whether, by increasing the height of the chimney, there would be a further increase in the proportionate value; but with the "London" burner the reverse seems to be the case, as shown in the following comparisons:—

Standard of Comparison, Sugg's "London" Burner, consuming 5·797 Feet per Hour, 6-in. Chimney; Initial Pressure = 13/10ths.

Name of Burner.	Consumption per Hour. Cubic Feet.	Comparative Value. Standard of Comparison = 1.	Comparative Value, calculated by Rule of Three.	Difference per Cent. between Real and Calculated Value.
Sugg's "London,"				
7-in. chimney. .	6·024 ..	0·986 ..	1·039 ..	5·37
8-in. do. . .	6·582 ..	1·073 ..	1·135 ..	5·77
9-in. do. . .	7·008 ..	1·138 ..	1·207 ..	6·06

For obvious reasons, I have made no experiments with flat-flame burners. Nor have I referred to those differences in construction which render one burner superior to another, nor to the other special conditions most favourable to the development of the illuminating power. These all enter more or less into the consideration of this question, but, taking the burners as they are, there is sufficient evidence in the foregoing experiments to justify the opinion that the ratio of increase of illuminating power is in direct proportion to the quantity consumed, and that any apparent deviation from it is attributable not to the incorrectness of the law, but to the conditions under the influence of which the consumption is effected.

Correspondence.

GAS AND WATER FACILITIES BILL.

SIR,—It is somewhat remarkable that, beyond your own comments upon it, the Gas and Water Facilities Bill should not have attracted more attention from companies and from private owners of such works than it has.

It is one of the most important measures affecting gas and water works already in existence without parliamentary powers which has ever been before Parliament.

The introduction of the bill is due, I believe, to a deputation originated by the Hawkhurst Gas Company, who waited on the President of the Board of Trade to lay before him the hardship to which such companies were continually being subjected by some cantankerous person, who took it into his head to show them what authority *he* had over them, and what little authority *they* had over the streets, where such authority was derived from the mere consent of the Town Commissioners, the Highway Board, or the Vestry.

Mr. Anthony Owst-Atkinson, of Hull, as an owner of gas-works, in common with myself, first drew my attention to the bill, and to the necessity of something being done to prevent its passing in its then incipient state.

Mr. Atkinson and myself went to London, and, by courtesy of one of the firm of Messrs. Baxter, Rose, and Norton, we obtained an interview with Mr. Shaw Lefevre, the acting president, in the absence of Mr. Bright, who gave every attention to all we had to say.

We stated that there were nearly a thousand gas and water works in the United Kingdom carrying on their business without parliamentary powers, and I ventured to state that I represented one-eighth of them; and I wish it to be known that I did so venture to represent them for the simple reason that there was no time to communicate with them, as the bill was then down for the second reading.

In addition to seeing Mr. Shaw Lefevre, several members of Parliament were communicated with.

As you have already commented upon the provisions of the bill, and given it *in extenso*, it is needless to go over the same ground again. I will, however, briefly state what we represented to the Vice-President of the Board of Trade, what it was we wanted, and what we believe we have obtained.

We represented that the bill, if passed in its then state, would enable the local authority to exact most onerous, and, if so minded, most *unfair* terms of the directors or private owners of existing gas and water works.

By the bill as it then stood it was necessary that the consent of the local authority should have been first obtained *before* an application could be made to the Board of Trade for a licence, which licence, if granted, would confer on the persons obtaining it all the powers conferred by a private Act; so that, if the local authority chose, the consent could have been withheld—assuming that it was the company or owner of the existing works applying for it—unless some reduction in the price charged for gas or water were made, or unless some conditions were submitted to which would involve either loss of *dividend* by acceding to one or the other, or of *property* if the consent were given, and the licence obtained by some opposing company or person.

We desired that, *in all existing works, the fact of their being in operation or in course of erection should be* primâ facie *evidence of the fact of the consent of the local authority having been obtained, and as such that they were entitled to go direct to the Board of Trade for the licence.*

Mr. Shaw Lefevre would not agree to this, as he thought it most desirable that the local authority should first be asked for the necessary consent; but he did agree to this, that if it were refused, then companies or private owners might apply without such formal consent

being first obtained, and if the Board of Trade found no good and sufficient reason for withholding the licence, they would then give it, despite the refusal of the local authority.

Mr. Lefevre said "that we must always suppose there to be at the Board of Trade reasonable men, who would as well protect the vested interests of existing owners as of the consumers," and the above was all he would feel inclined to do. He seemed quite unprepared to hear that there were so many gas and water companies carrying on business without their private Acts of Parliament.

Companies are not so much affected by this bill as *private owners*, as the shareholders are generally *the* local authority from which the consent will have to be obtained; but, even with such apparent security, *no local authority can give a legal right to another to break open the streets*, and all these thousand companies are at the mercy of any one, who chooses to do so, to stop them from interfering with the Queen's highway by opening trenches for the purpose of laying down or of repairing mains and services. As a matter of fact, not one in a hundred *does* get interfered with, but it is no less a fact that the whole hundred *might* be, and therefore if the bill (as no doubt it will) become law, neither companies nor private owners, carrying on their business as they now are by sufferance, should hesitate to apply for the licence, which, when obtained, will confer on them all the powers and privileges of a private Act, and I should imagine at one-tenth the cost.

The Board of Trade will, I have no doubt, protect *vested interests* in existing gas and water works, and therefore the bill, even in its present form, will be a great boon to both companies and private owners; and not *only* to them, for it will also be the means of getting gas and water introduced into localities where, but for the security the bill will give, capital could not otherwise be obtained.

GEO. BOWER.

St. Neots, June 1, 1870.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY 23, 1870.

The KIRKCALDY AND DYSART WATER, and the CLECKHEATON LOCAL BOARD Bills, were read a second time, and committed.

The HEBDEN BRIDGE GAS Bill was read a third time, and passed.

The SHIPLEY GAS Bill was read a third time, with the amendments; further amendments made, Bill passed, and sent to the Commons.

Petitions were deposited against the ASHTON-UNDER-LYNE, STALYBRIDGE, AND DUKINFIELD (DISTRICT) WATER Bill, from the London and North-Western Railway Company; Local Boards of Health for the Districts of Moseley and Hurst; the Earl of Stamford and Warrington; R. R. Whitehead and another; and John Lees and others.

TUESDAY, MAY 24.

The KIRKCALDY AND DYSART WATER Bill was reported, without amendment.

The ASHTON-UNDER-LYNE, STALYBRIDGE, AND DUKINFIELD (DISTRICT) WATER Bill, and the BUXTON GAS Bill, were read a second time, and committed.

The GAS AND WATER FACILITIES Bill was brought from the Commons, and read a first time.

The SALFORD BOROUGH IMPROVEMENT, and DUBLIN CORPORATION WATER Bills, were brought from the Commons, and read a first time.

The CARMARTHEN GAS Bill was returned from the Commons agreed to, with amendments.

FRIDAY, MAY 27.

The CARMARTHEN GAS Bill.—The Commons amendments considered and agreed to.

The BUXTON GAS Bill was reported, without amendment.

The CLECKHEATON LOCAL BOARD Bill was reported, with amendments.

The GASLIGHT AND COKE COMPANY; the ROTHERHAM AND KIMBERWORTH LOCAL BOARD OF HEALTH; and the SKIPTON WATER Bills, were brought from the Commons, and read a first time.

The READING GAS; the BATH CORPORATION; the LEEDS CORPORATION GAS (PURCHASE, &c.); and the RUABON WATER Bills, were returned from the Commons, with the amendments agreed to.

MONDAY, MAY 30.

The SHIPLEY GAS Bill was returned from the Commons, with the amendments agreed to.

The OLDHAM CORPORATION WATER, &c., Bill was read a second time, and committed.

The KIRKCALDY AND DYSART WATER, and the BUXTON GAS Bills, were read a third time, and passed.

TUESDAY, MAY 31.

The READING LOCAL BOARD OF HEALTH, and the LEEDS CORPORATION GAS, &c., Bills, were read a second time, and committed.

The CLECKHEATON LOCAL BOARD Bill was read a third time, with the amendments, passed, and sent to the Commons.

The HALIFAX WATER; NEWCASTLE AND GATESHEAD WATER; and ENNISKILLEN BOROUGH IMPROVEMENT Bills, were brought from the Commons, and read a first time.

The IMPERIAL CONTINENTAL GAS ASSOCIATION Bill was returned from the Commons agreed to.

The RAINHILL GAS AND WATER Bill was returned from the Commons agreed to, with amendments; the said amendments considered, and agreed to.

HOUSE OF COMMONS.

MONDAY, MAY 23, 1870.

The CARMARTHEN GAS Bill was read a third time, and passed, with amendments.

The GASLIGHT AND COKE COMPANY'S Bill, and the SKIPTON WATER Bill, as amended, were considered.

The ROTHERHAM AND KIMBERWORTH LOCAL BOARD OF HEALTH Bill, as amended, was considered, a clause added, and amendments made.

GAS AND WATER FACILITIES BILL.

On the motion for the third reading of this bill.

Sir C. B. ADDERLEY said: I rise to move that this bill be recommitted, for the purpose of making the alteration of which I have given notice. The bill proposes that provisional orders for gas and water works shall issue from the Board of Trade. Provisional orders for gas and water works at the present moment issue from the Home Office, or rather from the Local Government Office, which is a sub-department of the Home Office, and I think it cannot fail to lead to great inconvenience and confusion if provisional orders on the same subject issue from two offices. It will lead to great confusion if matters relating to local government are to be dealt with both by the Board of Trade and the Home Office, and if each is to issue provisional orders without the cognizance of the other. We are to have a bill consolidating the local government Acts, and among its provisions the question of water-works will be dealt with, and it is possible that on the recommendation of the Sanitary Commission a new office may be constituted. At this moment provisional orders will not issue from the Board of Trade, except for piers, harbours, and railways, and by the bill just passed for tramways as railways, and there can be no reason why gas and water works should be referred now, for the first time, to this department, while they still remain under the Home Office. I cannot understand why the honourable gentleman who so ably transacts the business of the Board of Trade in this House at this moment is opposed to my proposition, unless there is some jealousy on his part of the Home Office, and a greediness to get into his office as much as he possibly can. I should have thought he found enough work there already. If he can advance any reason why these provisional orders should issue from his office at the same time that they issue from the Home Office, I will willingly give way, but at present I can see no ground whatever for the proposal; and I think it hard that the public should be put to great inconvenience, and that confusion should be introduced into the business of local government, merely because the honourable gentleman wants to get as much as he can into his own office. If the honourable gentleman can persuade the House that all matters connected with local government should go to the Board of Trade, I am content; but in that case I say let them go to one office, and not to two, because that must lead to confusion, and prove a great hindrance to public business. My proposition, therefore, simply is, that where the Board of Trade is mentioned in the bill it should be omitted, for the purpose of substituting "central authority," and the insertion in the second clause of words defining the central authority to mean the department from which provisional orders are issued will, if a new office is constituted, transfer to the new office, whatever it may be, the power of issuing such orders. I beg to move—"That the bill be recommitted, for the purpose of substituting 'central authority' for 'Board of Trade' in the sixth and seventh sections, and inserting in clause 2 the following paragraph:—'Central authority shall mean the department charged for the time being with the issuing of provisional orders in relation to powers and works of public improvement, such as sewerage, water supply, lighting, and street regulations.'"

Mr. SHAW LEFEVRE: I am sure the House will believe me when I say that I do not wish to add to the work of the Board of Trade. The right honourable gentleman expresses surprise that I inserted "Board of Trade" instead of "Home Office" in these sections. I will tell him the reason. I found that some two years ago, when the late Government were in office, a long correspondence took place between the Home Office and the Board of Trade as to which of those two departments should undertake all work connected with the gas and water supply. The question was determined in favour of the Board of Trade, and in consequence the Board of Trade took up several important bills having reference to gas and water, and particularly to the gas companies of London. The right honourable member has stated that the Home Office, or rather the Public Health Department of the Home Office, has power to grant provisional orders to local authorities relating to the water supply, but it has no such power in the case of gas. So far as the water supply is concerned, there is something in the right honourable gentleman's argument, and it would be much more convenient if the Board of Trade, which has charge of several bills affecting gas, should in future deal with that subject. The subject has no connexion with sanitary questions, and therefore, as far as gas is concerned, the right honourable gentleman's arguments do not apply.

Sir C. ADDERLEY: The Home Office issues provisional orders in reference to lighting.

Mr. SHAW LEFEVRE: Yes, lighting the public streets; but they have no power to make provisional orders empowering the local authorities to make arrangements for supplying the inhabitants with gas. Therefore, as far as gas is concerned, the argument of the right honourable baronet falls to the ground. In another place, however, I shall be ready to procure the insertion of an amendment enabling the Queen in council to alter the department which shall be charged with these measures, so that if my right honourable friend's commission recommends that all these questions should be concentrated in one department, there may be no difficulty in giving effect to such a proposal.

Sir C. ADDERLEY: It would be useless to waste the time of the House by dividing, and I therefore withdraw my amendment.

The amendment was by leave of the House withdrawn, and the bill was read a third time, and passed.

TUESDAY, MAY 24.

The DUBLIN CORPORATION WATER Bill was read a third time, and passed.

The LEEDS GAS Bill was withdrawn.

The HALIFAX WATER, &c. (recommitted), Bill was reported.

WEDNESDAY, MAY 25.

The RAINHILL GAS AND WATER Bill, as amended, was considered.

THURSDAY, MAY 26.

The READING GAS Bill.—The Lords amendment agreed to.

The BATH CORPORATION, LEEDS CORPORATION GAS (PURCHASE, &c.), and RUABON WATER Bills.—The Lords amendments were agreed to.

The GASLIGHT AND COKE COMPANY; the ROTHERHAM AND KIMBERWORTH LOCAL BOARD OF HEALTH; and the SKIPTON WATER Bills, were read a third time, and passed.

FRIDAY, MAY 27.

The SHIPLEY GAS Bill.—The Lords amendments were agreed to.

The NEWCASTLE AND GATESHEAD WATER Bill, as amended, was considered, and amendments made.

MONDAY, MAY 30.

The IMPERIAL CONTINENTAL GAS ASSOCIATION Bill, and the RAINHILL GAS AND WATER Bill, were read a third time, and passed.

The ENNISKILLEN BOROUGH IMPROVEMENT, and HALIFAX WATER, &c. (recommitted), Bills, as amended, were considered.

TUESDAY, MAY 31.

The NEWCASTLE AND GATESHEAD WATER Bill was read a third time, and passed.

The HALIFAX WATER, &c., Bill, and the ENNISKILLEN BOROUGH IMPROVEMENT Bill, were read a third time, and passed.

Legal Intelligence.

COURT OF CHANCERY.—Monday, May 30.

(Before Vice-Chancellor Sir J. Stuart.)

THE ATTORNEY-GENERAL *v.* THE MAYOR, ALDERMEN, AND BURGESSES OF THE BOROUGH OF ST. HELEN'S.

Sir Roundell Palmer, Q.C., Mr. Dickinson, Q.C., Mr. Michael (of the common law bar), and Mr. Fischer appeared for the informant; and Mr. Greene, Q.C., and Mr. Freeling for the defendants.

In this case an information had been filed by the Attorney-General on the relation of Edward Penrose Twyford and Richard Worsley, two ratepayers of the borough of St. Helen's, in the county of Lancaster, and this was a motion for an injunction to restrain the defendants, the Mayor, Aldermen, and Burgesses of St. Helen's, and their Town Council, Treasurer, servants, and agents, from applying any part of the borough fund, or any rates levied or to be levied in the borough in or towards the costs and expenses already incurred, or hereafter to be incurred, in opposing a bill introduced by the St. Helen's Gas Company into Parliament.

Sir R. Palmer, in moving for an injunction, said the Corporation of St. Helen's filled what he might describe as a double character, for though, under their present Act of Parliament, they were combined in one as a corporation, they were originally Improvement Commissioners, in which capacity they were empowered to and did acquire the property of a water-works company which had previously been established. The Improvement Commissioners being in existence, the Local Government Act was adopted in St. Helen's, and a Charter of Incorporation was granted by the Crown upon the footing of the Municipal Corporations Act, and to the corporation so created the powers of the Improvement Commissioners were transferred. These powers were, in the main, such as were ordinarily found vested in Improvement Commissioners, and they with those of a municipal corporation were brought together and consolidated in an extremely long Act, called the St. Helen's Improvement Act, 1869 (32 & 33 Vict., c. 120). And inasmuch as the present case depended upon the operation and effect of those portions of this Act which related to the appropriation of the funds at the command of the defendants, and their powers in respect to those funds, it would be necessary to put the court in possession of a general outline of that Act. As he had stated, it was a very long Act, containing no less than 446 clauses. It began by repealing the former Acts, and by the 8th clause it was provided that the present Act should apply to the borough of St. Helen's exclusively. By the 10th, the powers created by former Acts were transferred to the corporation; and by the 21st, power was given them to contract for the completion of works already authorized. Then followed several series of clauses relating to subjects usually comprehended in local government and improvement Acts. The first of these related to water and gas. Those relating to water had no direct bearing upon the present matter, and such indirect bearing as they had was chiefly inferential on the clauses as to gas. As already stated, before the corporation was created, the Improvement Commissioners had acquired certain water-works. These clauses provided for the management of that undertaking, and it was enacted that separate accounts should be kept, and that the water supply should not be made a charge upon the general borough-rate. Then as to the gas clauses, they had no bearing upon the proceedings which were now sought to be restrained. They referred to two subjects only—the first giving power to the corporation to contract for the supply of gas for the public lamps with the existing gas company, and the second a power to acquire by purchase—not compulsorily, but by agreement—the works of the gas company. It was a part of the facts of the case not in dispute that there was an application made by the corporation to the gas company, before the bill to which the present motion related was filed, to sell their undertaking, and that the gas company had absolutely refused to do so. Therefore, the corporation had gained nothing by these clauses in their Act. It was necessary, however, to bring these clauses briefly under the notice of the court. By the 82nd, it was provided that the corporation might contract for any period not exceeding three years with the existing gas company for a supply of gas to the public lamps, the price to be charged for which was not to be greater than the lowest price for the time being charged by the company to any private consumer. Then followed in the 83rd clause a power to purchase by agreement, which had been sought to be acted upon without success by the corporation. By the 85th clause, in the event of such purchase, licence or authority was given to the corporation to use any patent process. The 86th clause regulated the price to be charged for gas by the corporation if they bought the works, which they had not done; the 87th clause regulated the illuminating power of the gas to be supplied by them, and then followed clauses for protecting their pipes. But inasmuch as the gas company were not willing to sell, and no sale of the works was now contemplated, these provisions might be dismissed from consideration. Passing rapidly over the subsequent clauses down to 337, they came to what he might call the money clauses—rating clauses, in the first instance, and then clauses relating to the application of the borough fund and the borrowing powers of the corporation. By the 338th clause the corporation were empowered to raise highway-rates, which rates were directed to be carried to a separate account, and to be exclusively applied to the highways. The 339th clause in like manner provided that all water-rates should be carried to a separate account, and applied to water-works purposes, and there was also a provision for a reduction in the water-rates if any surplus of the fund existed enabling such reduction to be made. Then came provisions with reference to the appropriation of the borough fund, and the order in which the claims upon it should be discharged, and it was enacted that "the surplus, if any, shall be applied by the corporation, as they think best, for the benefit of the inhabitants or the improvement of the borough." Now, even supposing—which he only did for a single moment, for argument's sake, and not by any means admitting the hypothesis—that the purpose from which it was sought by the present proceedings to restrain the defendants was a purpose to which the surplus might be applied, it was plainly proved by the evidence that no such surplus could be in existence, as rates were being made in the borough to meet the prior charges existing upon the fund. But he should contend that it was totally impossible to hold that, if there were a surplus, the application of that surplus for parliamentary expenses not authorized by the Act, and not incurred in the defence of any property vested in the corporation, could come within the meaning of this clause as a purpose "for the benefit of the inhabitants or the improvement of the borough." By the 345th clause it was provided that the corporation should keep separate accounts of the gas undertaking if and when they purchased the works of the company. So that the court would see the intention of the Legislature was that, in the event of an event which had not happened, the gas-works were to pay their own expenses, and not come into the general expenses of the corporation. By the 347th clause it was provided that in case at any time the borough fund should be insufficient for the payment of the moneys charged upon and payable thereout, the corporation might annually or oftener raise such a sum by means of a borough-rate as it was estimated would be sufficient to make up the deficiency. Then followed other clauses (to which the learned counsel referred *seriatim*) relating to the mode of assessment, none of which were material to this case, and others relating to the borrowing of moneys for the purposes specified in the Act, all of which purposes were wholly inconsistent with those from which the present proceedings sought to restrain the corporation. The gas company of St. Helen's was a company empowered by special Act of Parliament, and had the exclusive right to supply gas in the borough. On the 8th of October, 1869, the corporation entered into a three years contract with the company for the supply of gas to the public lamps of the town, which contract was still subsisting. The terms of it were for the most part of the usual character, and the only portion necessary to be referred to was the question of price. His honour would recollect that by the Act of Parliament the price to be charged to the corporation was the lowest price for the time being charged to any private consumer. The provision in the contract was, that "the corporation will purchase and take from the gas company all the gas that shall from time to time, during the three years, be necessary and required for the purpose of lighting the public lamps within the borough, and shall and will pay to the gas company 5s. for every 1000 cubic feet by quarterly payments," &c.; and then there was this proviso—first, that there should be a certain rebate or discount of 25 per cent. during the term, so long as the gas consumed exceeded 1 million cubic feet per annum; and next, that if at any time, during the continuance of the contract, the company should supply to any consumer gas at a less price than was payable as above mentioned, the corporation should be entitled to an abatement per 1000 cubic feet equal to the difference between these amounts. As a matter of fact, the corporation consumed about 4 million cubic feet of gas, so that they obtained the full benefit of the provisions in the contract, and the price actually paid by them, as stated in the evidence, was 3s. 9d. per 1000 cubic feet. It appeared also in the evidence that in the autumn of last year an application was made by the corporation to the gas company to know whether they would sell their undertaking, and the company absolutely refused to sell, so that there was no controversy on this point. In this state of things the gas company, during the present session, introduced a bill into Parliament of the usual character, asking for additional powers. This bill contained no clause interfering in any way with the affairs of the corporation, nor in any way affecting the contract between them and the gas company. Of course, if any such clauses had been contained in the bill, the corporation would have been perfectly right in defending itself; or if a provision had been inserted making it *ultra vires* for the corporation to buy the works, supposing the company were willing to sell, then there might have been a *locus standi* to oppose it at the expense of the borough. But this bill did not in any way, directly or indirectly, interfere with the existing contract, or with any of the gas clauses in the Act of the corporation. It simply asked for power to carry out those extensions which gas companies in their own interest might legitimately seek. It proposed in substance two things only—one to extend the area over which the company's undertaking might be carried into certain townships outside the borough, their existing district including twice as large an area as the borough itself, and the other to increase their capital for the purpose of efficiently carrying on their business. The bill had already passed the House of Lords, where it encountered the opposition of the corporation. This opposition was threatened to be renewed in the House of Commons, where it was admitted by the defendants it would be much more costly. The Attorney-General, at the instance of two ratepayers in the borough, and who were said to be interested in the gas company—though he (Sir R. Palmer) held that to be immaterial—had interposed to prevent the further waste and improper expenditure of the corporation funds.

The Vice-Chancellor: I suppose your equity depends upon the allegations in the 17th section—that the corporation have presented a petition to the House of Commons, asserting that the clauses of the company's bill would be most injurious to their rights and interest, and that there is no provision for their protection. Did the petition to Parliament contain nothing but general allegations?

Sir R. Palmer: I will put your honour in possession of them. They were a little more specific, but it is convenient that your honour should be first made acquainted with the nature of the bill as introduced into the House of Lords.

The Vice-Chancellor: My observation had reference to this, that if your equity depends upon the nature of the allegations in the petition, I should have expected more particular statements in your bill as to what those allegations were, for they are very vague.

Sir R. Palmer said he thought it would hardly be considered that this was necessary. The equity was an old equity—that by the Act of Parliament under which the municipal corporation was governed, its funds were to be appropriated in a manner inconsistent with the manner in which it was now proposed to expend them. The learned counsel then read the heads of the clauses of the gas company's bill, as introduced into the House of Lords, and pointed out what modifications were made in the bill in committee. The petition presented by the corporation against it, after reciting the incorporation of the company, stated that it was proposed by the bill to alter and extend the limits within which the company might supply gas outside of the borough, and that powers were sought to increase the capital to the extent of £92,000, with borrow to borrow on mortgage £11,500 in respect of the £46,000 of existing capital, and a further sum of £23,000 in respect of the new share capital, and that the limit of the price of gas supplied by the company was fixed at 5s. per 1000 feet, and the illuminating power at 18 candles. It then recited that by the St. Helen's Improvement Act, 1869, the corporation had power to purchase by agreement the undertaking of the gas company, but that the company had declined to sell to the corporation. In the 7th paragraph it stated that, in the event of the corporation exercising their power of purchase, it was provided by the Improvement Act that the price of gas thereafter supplied by them should be limited to 4s. within the borough of St. Helen's, and to 4s. 6d. in those portions of the townships of Eccleston and Windle lying beyond the borough. The 8th clause stated that the maximum rate prescribed by the gas company's Act was 5s. per 1000 feet, but that the corporation were now supplied with gas to the public lamps by the said company in accordance with section 82 of the Improvement Act, 1869, inserted at the request and by agreement with the gas company at the rate of 3s. 9d. per 1000 feet, being the lowest rate charged by the company to consumers of upwards of 1 million cubic feet per annum, who may have executed an agreement to consume the company's gas for a period of five years, consumers of smaller quantities or for shorter periods being charged the maximum rate of 5s. per 1000 feet, subject, in certain cases, to a discount of only 10 per cent. upon specific conditions being performed. The corporation could have no ground of complaint in this matter, because they were safe whatever the maximum price might be, they being entitled to be charged the minimum rate. The petition proceeded to state that the corporation were of opinion, considering the local advantages of St. Helen's, and the unusual facilities it offered for making gas economically, that the charges now made by the gas company were excessive and ought to be reduced; that the maximum rate to be hereafter charged should be limited and restricted to at least a price not exceeding that prescribed by the Improvement Act, 1869, or to prices not exceeding those current in the neighbouring towns of Wigan and Warrington; that the charges made in the accounts of the company in some respects were excessive, and increased the cost price of the gas unnecessarily; that the power sought by the company to extend their limits of supply beyond the townships or districts authorized by their former Acts would, if granted, operate most injuriously to the corporation, as such extension beyond the borough into thinly populated and remote districts must necessarily be less remunerative to the company than the supply within the borough, and become a heavy charge upon the undertaking, the proposed increase of capital being unnecessary for the development of their undertaking, the limits of which were already sufficiently extensive. The petition then stated that, in the opinion of the corporation, if the extended limits were granted, Parliament should require the company to keep separate accounts of such additional works as might be sanctioned beyond the borough or their present limits, and that such additional outlay should be provided by borrowing, at limited interest, on the security of the existing undertaking, such sums as might be shown, to

the satisfaction of an auditor appointed by the corporation, to be necessary for such works, not exceeding in the aggregate the amount usually granted by Parliament on such security. It also expressed the opinion that the proposed arrangements with regard to the testing of the quality of the gas were insufficient and unsatisfactory, and should be more adequately provided for; and that it was desirable the bill should confer ample powers upon the corporation for securing the appointment of auditors, and the necessary facilities for investigating the quality of gas, prescribing the degrees of purity practicable, and for the auditing of the company's accounts, as provided for in the City of London Gas Act, 1868. What was the meaning of all this? Was it needful for the protection of the corporation, they having already entered into a contract with the company for a period of three years? They seemed to be volunteering for private consumers, and not for themselves, the adoption of some provisions out of an Act relating to the supply of gas in the metropolis, which were totally irrelevant. The real meaning of the petition was this—that the corporation were endeavouring, by the *locus standi* they obtained against the bill, to secure for themselves the position of promoters of a bill, in order to give them powers over the gas company. The gas company were subject to the Gas-Works Clauses Act, 1847; and so far as their customers might have an interest in these matters, the 38th section of that Act provided all that was necessary in the way of security to the public. This was really an attempt, under the guise of opposition, to get the General Act repealed in their case, and to confer upon them powers which no law had given them, and which the general law provided for otherwise. Having placed the court in possession of these facts, he had only to add a word on this part of the case as to the actual state of the finances of the corporation. The borough fund was insufficient for the payment of the moneys charged upon and payable thereout, under the provisions of the Improvement Act, 1860, and in consequence thereof the defendants—the corporation—on or about the 14th of December, 1869, caused a borough-rate of 8d. in the pound to be raised, which could not have been done except for the deficiency in such fund, to meet the special purposes to which it was expressly applied by Parliament. The grounds of the present application were that the costs incurred in this opposition to the gas company's bill would not be beneficial to the borough; that the purposes for which those costs were incurred were entirely extrinsic and irrelevant to any legitimate interest of the corporation; and, in addition to this, that the borough fund, every shilling of which was appropriated to a particular purpose, was deficient, and that in consequence of such deficiency the corporation had levied a rate which but for such deficiency they would have no power to do. With regard to the authorities on this subject, it would only be necessary to say a few words. His honour would recollect that very recently in this court an injunction was granted to restrain the Corporation of Sheffield from applying the corporate funds in the promotion of a water and gas bill; but as that case had not yet been reported, he would say no more about it, and would only refer to the numerous cases in which, when the object had been to get additional powers not at present possessed by such bodies, it had been decided that, though not prevented from approaching Parliament with their requests, they would be prohibited from appropriating their corporate funds to the payment of the cost of such applications. The first case was that of *The Attorney-General and the Guardians of the Poor of Southampton*, which was an application to Parliament to vary the mode of rating. There the Vice-Chancellor, in giving judgment, said the very fact of their going to Parliament showed that they had not the power already, and they could not be empowered to use the public money for the purpose; certainly they could not do it under cover of an opposition any more than they could do it directly. The next case was that of *The Attorney-General v. The Corporation of Norwich*, in which the Corporation were restrained from soliciting at the expense of the borough fund a bill in Parliament to improve the navigation of the river flowing through that city to Yarmouth. In their Act it was provided that, in case the borough fund was more than sufficient for the purposes to which it was primarily applicable, it should be applied, under the direction of the Town Council, to the improvement of the borough. Those words were the same words as in the corresponding clause of the Municipal Corporations Act, and were relied upon in this case. The corporation said, "We are getting these additional powers for the improvement of the borough;" but the Vice-Chancellor held that they were not authorized to apply their funds in obtaining powers which were not then vested in them, and could not be vested in them (except by a special Act passed for the purpose). If, he said, the coporation or private individuals thought proper to apply to Parliament to carry into effect a project which might eventually fail, the court would not enable them to pay the expenses out of a trust fund, and therefore he should continue the injunction. Now if there were any comparison between the present case and that, it was clearly in favour of the latter, which was an attempt to improve powers already possessed by the corporation of Norwich, whereas in the former the attempt was to acquire power over the gas company, which the corporation of St. Helen's did not in any way at present possess. The next case was that of *The Attorney-General v. Andrews*, which was a case in which certain commissioners were empowered, under an Act of Parliament, to supply Southampton with water, and to make an assessment for the purpose. There it was held that, though the commissioners might have applied the funds raised under their Act in resisting proceedings in Parliament prejudicial to the object for which they were incorporated, they were not justified in applying those funds to defray the expenses of obtaining another Act giving them more extensive powers than they already possessed. The same principle was carried out by Vice-Chancellor Wood in the case of *The Attorney-General v. Eastleigh*, but he (Sir R. Palmer) passed rapidly over these cases, which might easily be multiplied, and which established the position that, if in this instance the corporation were promoting a bill to get control over the gas company (which was manifestly the object of their opposition) they would be restrained from applying corporate funds to the expenses of such a parliamentary proceeding. He now came to the cases of opposition, and he thought it would be found that the same principle had been very clearly laid down. The first case was that of *Bright v. North*. There the conservators of a river were empowered to apply the rates raised under their Act of Parliament in doing all such acts, matters, and things for putting the banks into a state of permanence and stability, and it was held that they were authorized in applying a portion of the fund in watching, and if necessary opposing a project in Parliament affecting the river lower down, which was likely to be injurious to the banks under their control. That decision was directly founded on the alleged injury to their property. The Lord Chancellor in his judgment said it was clear that, if actual injury had been done, and proper measures had been taken by the commissioners to correct it, they would be entitled to be allowed their expenses so incurred, for every trustee was allowed the necessary and proper expenses incurred in protecting the property in his care. In the case of *The Attorney-General v. The Mayor, &c., of Wigan*, the same was affirmed by the Lords Justices. There an incorporated company had the benefit of a river basin, which was the main sewer of two-thirds of the town, and a bill was before Parliament for the purpose of enabling certain parties to abstract a very large portion of the water from this river before it reached the town. It was held that under the Municipal Corporations Act, particularly sections 90 and 92, whether the corporation of the town had any surplus borough fund or not, as they would be justified in incurring the expenses of an injunction to prevent such a nuisance being created, they would be equally justified in applying their funds to prevent a threatened injury to the river; and the Vice-Chancellor, in his judgment, after referring to the dictum of Lord Cranworth in *Bright v. North*, said it must be assumed that, if some one did not oppose the passing of the Act of Parliament, there would be a loss for all time for all practicable purposes to the town of Wigan. There were rights in this case which were directly invaded, and the corporation were justified in defending them. The cases just quoted showed what might be done in the way of opposition. He would now call attention to another case, which determined that such expenses could not be incurred except when there was such a justification. It was the case of *Marris v. The Worksop Board of Health*, which was argued in the Court of Queen's Bench. The appellants were occupiers of premises, and the opinion of the court was asked as to the validity of a rate made by the Local Board of Health. It was there held that the costs incurred by the board in defending a bill in Chancery were justifiable, the costs of a *quo warranto* were not justifiable as not within their authority, and that the expenses of opposing a bill in Parliament were not justifiable. Lord Campbell said he was of opinion that the rate was bad, because it was made for an illegal purpose. A *quo warranto* was issued against individual members of the board, to ascertain whether they were duly elected, which was held to be a personal matter, and the expenses as not coming within the provisions of the Statute. With regard to the Chancery suit, Lord Campbell said he had no doubt at all that it would be lawful purport to apply the funds to defraying the expenses, because they were *bond fide* and necessarily incurred; but with regard to the expenses of opposing the bill (of a gas company) in Parliament, Lord Campbell said: "Upon the facts as they stand, my opinion is that they are not justifiable, because it does not at all appear that there was any necessity for it; no advantage was gained, and it does not appear that there was any likelihood of any advantage; and any presumption that there might be, that they were doing what was necessary, seems to me to have been rebutted by nothing having been at all obtained by the opposition which was offered. Now, this is a most beneficial Act of Parliament, but it is liable to great abuse. I know of no Act of Parliament where there is a greater chance of jobbery arising under it, and it is our duty to do all that we can to enforce the Act of Parliament, and wherever the Board of Health are justly exercising their powers to assist them for the public benefit; but it is indispensably necessary that we should guard the ratepayers against any misapplication of the funds. If it were to be supposed that the expense of opposing a bill in Parliament might be thrown on the ratepayers, I am sure that great abuses would arise, and that the ratepayers would be very much injured thereby; but I by no means say that a case may not arise where it may be a very fit thing that the Board of Health should oppose a bill. If it is shown that such a case does arise, they may act prudently and properly; and above all, if they call a meeting of ratepayers, and have the previous consent of the ratepayers to the incurring of that expense, then they would be safe, and they might apply the funds to the expense of so doing." In the present case it was sought by the evidence on the other side to show that such a meeting had been called, but the character of that meeting and how it was conducted would have to be referred to. As, however, the evidence would have to be read through, he would not now go into it, and would only say that in a case where injury to the corporation was likely to arise, the assent of such a meeting might be held to justify the opposition to a bill in Parliament, but certainly not in a case where no such injury was threatened. He, therefore, submitted to the court that the injunction asked for should be granted.

Mr. Dickinson read the affidavits of Messrs. Twyford and Worsley, the relators, in which the facts stated in the opening address of counsel were proved, and which stated that the borough fund for the current year was £778 deficient, independent of the expenses of the corporation opposition to the gas company's bill. He also read an affidavit made by Thomas Sherlock, a ratepayer, but unconnected with the gas company, who stated that in his opinion the interests of the corporation were not interfered with by the bill, and who deposed to the deficiency in the borough fund. He stated that on the 4th of May he attended with a deputation a meeting of the Town Council, and presented a protest against the application of the borough rates to the opposition.

Mr. Greene said this gentleman was a strong partisan.

The Vice-Chancellor remarked that it might be supposed he was, or he would not have made an affidavit. He came forward to protect his own pocket.

Mr. Dickinson read the affidavit of Mr. James Harrison, a ratepayer, a shareholder in the gas company, and a member of the Town Council, who stated that at a meeting of the Town Council on the 6th of April, he asked the town-clerk what part of the borough fund could be applied to defray the expenses of the opposition. The mayor objected to the question being answered, but stated it was not to be concealed that the opposition in the Commons would be more costly than it had been in the Lords.

Mr. Freeling read the affidavit of Mr. H. Pilkington, the town-clerk, reciting the fact of the passing of the Improvement Act of 1869, with the purchasing clauses. He stated that he was instructed to apply to the gas company last autumn to know whether they would sell their works, and that they declined to do so. He deposed also to the terms of the contract for the public lighting, recently entered into between the company and the corporation, and to the proceedings on the company's bill in the House of Lords. The company asked for power to raise £92,000, and to extend their area into several townships, but there was no proposition in the bill to reduce the maximum price of gas. The bill as it passed the Lords empowered the company to raise only £24,000, and to borrow £17,500; the maximum price of gas was reduced from 5s. to 4s. 6d.; and the proposed extension to Rainhill was not allowed.

The Vice-Chancellor: This is to prove the successful opposition of the corporation.

Mr. Freeling: Yes; as to the reduction of the capital and price.

The Vice-Chancellor: What has the capital to do with it?

Mr. Michael: The illuminating power of the gas was also reduced from 20 to 14 candles.

The Vice-Chancellor: Was the illuminating power reduced as well as the price?

Mr. Michael: Yes; from 20 to 14 candles—6 candles difference in illuminating power, and 6d. in price.

Mr. Freeling said the affidavit of Mr. Pilkington further stated that the bill, if passed, would be injurious to the corporation. It would interfere with their rights, inasmuch as by the 379th section of the Improvement Act of last session the sum to be expended by the corporation in the purchase of the gas and water undertakings was limited to £100,000, and the whole of such sum would not be sufficient for the purchase of the gas-works with the proposed extension of limit of supply, even if the Improvement Act authorized their undertaking it.

The Vice-Chancellor said he did not quite understand this.

Mr. Freeling said they were only entitled to raise £100,000 for the whole purposes of gas and water and other improvements, and that sum would not be sufficient to cover the purchase-money for the gas-works alone, with the extended limits sought for by the company. Mr. Pilkington, in his affidavit, also said that the result of the extension of limits would be to keep up the price of gas in the borough, inasmuch as the company would have to make a large outlay to supply the new districts, so that the interests of the corporation would be seriously interfered with, and therefore the increase of price would fall upon the borough fund and the rates in aid thereof. He further stated that he was present at a meeting in the town-hall, on the 28th of April, when a resolution was passed affirming that having regard to the price of gas in towns similar to St. Helen's, the council were of opinion that the price in St. Helen's should not be more than 3s. 6d. per 1000 cubic feet, and remitting to a committee the duty of obtaining clauses of a satisfactory nature in the company's bill before Parliament. He also stated that he was present at a subsequent meeting, held on the 4th of May, when a deputation, stated to be composed of ratepayers of the

borough, attended, and handed in a protest against the opposition of the corporation to the gas bill. That protest, which had been open for signature 14 days, was signed by 72 persons only, and to his (deponent's) knowledge several of those were directors or shareholders in the company. On the other hand, a requisition to the mayor to convene a public meeting of the inhabitants to oppose the bill was signed by 502 persons in the course of 24 hours, and at the meeting so called, which was attended by 400 persons, a petition to the House of Commons against the bill was unanimously adopted. A second petition in opposition, had, up to the present time, been signed by upwards of 1500 persons. Deponent added that in his opinion the opposition in the House of Commons would not be so expensive as that in the Lords had been. The opposition of the Town Council was not from any personal motive, but was carried on in the interest of the ratepayers, because they believed the passing of the bill was calculated to throw additional burdens on the borough. An affidavit by Mr. J. Johnson, borough treasurer, was read, stating that a borough-rate of 8d. was made in December last for the expenses of the then current year; that the moneys to be levied were sufficient for the purposes of the borough; that there was a considerable sum of money in the bank, and that it would not be necessary to levy an additional rate for the expenses already incurred or to be incurred in conducting the opposition to the company's bill, the surplus fund before referred to being amply sufficient. The affidavit of Joseph Greener and Thomas Barrow was read. It stated that deponents were ratepayers and owners of large property in the borough, and were shareholders in the gas company; that they were present in the council on the 4th of May, when the protest was handed in, and they said the same as the former witness as to the signatures thereto and to the requisition for the public meeting. They added that the borough-rate could never exceed 1s. in the pound, except with the special consent of the inhabitants; that the bill promoted by the gas company would interfere with the rights of the corporation, inasmuch as the amount they were authorized to raise for the purchase of the works would, with the extensions asked for, be inadequate for the purpose.

Mr. DICKINSON said there were 45,000 inhabitants in St. Helen's, but the public meeting in opposition to the bill was only attended by 400.

Mr. FREELING said the deponents stated that the effect of granting such extensions would be to keep up the price of gas in the borough, and that any increase which might take place would, as far as the public lamps were concerned, fall upon the borough fund.

The VICE-CHANCELLOR said there was no reference in this affidavit to the meeting at which the resolution to oppose the company was passed.

Mr. FISCHER said the witnesses were not present. It was only a mob of people got together who were not ratepayers. The learned counsel read a lengthened affidavit by Mr. Ansdill, solicitor to the informants, which went very minutely into details of circumstances connected with the passing of the Improvement Act of last session. It stated that Mr. Pilkington had only been town-clerk of the borough since July last, after the Improvement Act received the Royal Assent, and that he was not present during the inquiry in Parliament this year.

The VICE-CHANCELLOR said he did not think much turned upon this.

Mr. FISCHER said the object of this part of the affidavit was to show that the corporation had control over a small portion only of the area comprised in the company's limits of supply, and that the powers they obtained last session were by surprise to the gas company. The affidavit having referred to the history of the promotion of the company's bill this session, stated that it was not because of the opposition of the corporation that Rainhill was left out of their extended district, or that the maximum price and illuminating standard were altered. Deponent added, with reference to the permissive purchase of the gas-works given to the corporation in their Improvement Act, that their borrowing powers were only applicable in the fifth place to such purchase, and that the water undertaking, which was the primary charge, had not been met.

TUESDAY, MAY 31.

Mr. DICKINSON resumed the reading of the affidavits this day. He said there was a further affidavit by Mr. Ansdill simply proving the fact alleged of the deficiency of the borough fund, and the creation of a rate to meet that deficiency.

The VICE-CHANCELLOR said he did not quite understand this part of the case. Was it alleged that the borough fund was insufficient, and the corporation had no power to levy another rate?

Mr. DICKINSON said the object was to prove that the borough fund applicable to the particular purposes in the Act mentioned was insufficient for those purposes, and therefore the corporation had been obliged to levy a rate of 8d. in the pound to meet the deficiency. The informants alleged that to defray the expenses of going to Parliament to oppose the gas company they would be obliged to levy another rate, and that it would be an improper application of the money.

The VICE-CHANCELLOR said if that was all, it was only a question whether this was a proper application of the fund.

Mr. DICKINSON said practically it would be so. There were further affidavits, the purport of them being that which the other side alleged in their petition to the House of Lords, that the extension of the company's business to neighbouring districts would cause them to make higher charges in those districts or would affect their profits, and that in either case it would be disadvantageous for the corporation hereafter to purchase the business of the company. He did not, however, think it necessary to occupy time in reading these affidavits, and would proceed at once to address a few observations to the court. His honour no doubt would recollect, from the reading of the clauses of the Act of Parliament, what was the constitution of the Corporation of St. Helen's with respect to the particular things which were the subject matter now under consideration. The corporation had nothing to do with the question of the gas supply except in two ways. They were required to light the town by means of a contract with the company for a supply of gas, or, instead of being customers, by purchasing the whole undertaking of the company. The first of these obligations they had fulfilled, and there was an existing contract between the corporation and the gas company for the public lamps for a period of three years from the 1st of January last. Under this contract they were charged at the rate of 3s. 9d. per 1000 feet, which was the lowest price charged to any private consumer burning above a certain quantity of gas. These were the most advantageous terms they could have; in fact, they were the very terms which, if the corporation purchased the works, they would themselves impose upon the town. So that the one object—viz., that of obtaining gas—was clearly and satisfactorily obtained by the existing contract. With reference to the others, it would be remembered, that the corporation had the power of purchasing the undertaking of the company—not a compulsory power in an Act of Parliament affecting the gas company, but a permissive power in an Act of Parliament regulating their own powers and authorities as between themselves and the body which they governed. It was in evidence, and was so stated in their petition to Parliament, that they had endeavoured to effect the purchase of the company's business, but the company had declined to sell. That being the case, what did the corporation now propose to do, and what was it that the informants sought to restrain them from employing the corporate funds in endeavouring to accomplish? The gas company had introduced into Parliament a bill authorizing them to extend the district within which they might supply gas, and to raise the necessary additional capital for the purpose. They did not seek by this bill to raise the price of gas charged to consumers in the borough, nor to interfere with the powers the corporation possessed of purchasing by agreement their undertaking. That being so, the rights and powers of the corporation were entirely unaffected. But the corporation wanted to get something for themselves. Under the cover of opposition to the company's bill, they sought to get clauses introduced which would benefit them, and give them additional powers. They said in effect: "Your business being now of a certain extent and value, we can, under our Act of Parliament, purchase the undertaking for a sum within the £100,000 we are authorized to raise, but if you improve and extend your business it will become more valuable, and we may not be able to purchase it for less than £150,000. And therefore, though you are under no obligation to sell either for £100,000 or £150,000, we will endeavour, under cover of our opposition, to prevent your extending your business." This was an attempt to obtain for themselves new additional powers at the expense of the gas company, instead of being a simple opposition to the bill as introduced. With regard to the public lighting, the company were under a contract to supply the corporation at 3s. 9d. per 1000 feet, and if the bill passed they would still be supplied at that rate; and if, at any future time, there should be a reduction of price to private consumers, they would be entitled, notwithstanding the Act of Parliament, to the full benefit of it. So far, therefore, as the price of gas was concerned, there was no ground whatever for their opposition to the bill. The learned counsel having referred at some length to the bill as introduced into the House of Lords, and the petition of the corporation against it, he submitted that it must be evident from a consideration of the latter that the corporation desired by their opposition to obtain additional powers for themselves, to enforce on the company a lower price for gas than the corporation would supply it at if they became suppliers of the article, and to restrain them from extending their limits, so as to make the cost of purchasing the works hereafter less costly. The opposition, therefore, was not an opposition to a state of things existing already, but for the purpose of creating an alteration for the benefit of the corporation, and giving them powers which they did not possess before. The opposition being of this character, was it one for the costs of which the borough fund, or the rate in aid of that fund, could be properly applied. Without going into the Act of Parliament describing the object of that fund, he maintained that the court, seeing this was a mere covert attempt by means of an opposition to get a bill of their own, would determine that such an application of the borough fund could not be made. But if the purposes for which the borough fund could be applied were regarded, it would be seen that they were very precise, and that nothing could justify such a charge as this upon it. The corporation opposed the bill in the House of Lords, but practically the bill for all purposes which affected the interests of the borough left that House in the same condition in which it entered. The opposition, which was unsuccessful in the House of Lords, the corporation now desired to repeat in the House of Commons at the expense of the ratepayers who objected to it. It had been said that some of the witnesses for the relators were partisans, and that therefore weight should not be given to their evidence. It was because they were partisans that they were witnesses; they were ratepayers, and it was because they disliked their money being applied to improper purposes that they came forward to prevent, if possible, this expenditure of the borough funds. The fact of partisanship was the strongest feature in their evidence; it showed how they themselves, being ratepayers, objected to the application of the borough fund to this purpose. Although these witnesses might not be a majority of the ratepayers, they were sufficient to put in action the powers of this court, in order to put a stop to that which was illegal—viz., an attempt, under cover of an opposition to a bill which did not in any way affect the corporation, to gain additional powers for themselves, which, if they came honourably and in a straightforward manner to obtain by means of a bill of their own, would be the subject of resistance in this court. He submitted that there was no valid distinction between the two, and that under all the circumstances the proposed expenditure of the borough fund was illegal, and ought to be restrained.

Mr. FISCHER followed on the same side, and submitted that on the evidence the court would have no hesitation in saying that the object of the corporation was to cheapen the price of gas, but that, however desirable such an object might be, it was not one the costs attending which the corporation were authorized by law.

Mr. MICHAEL, in closing the case for the relators, said the object of the suit was not to restrain the defendants from opposing the bill of the gas company in Parliament, but to restrain them from using the borough rates to defray the expenses connected with that opposition. It was quite clear by the Standing Orders of Parliament, and especially by the 131st Standing Order of the House of Commons, that it was competent for a municipal authority, if the Referees on Private Bills saw fit to allow them, to oppose a bill of this kind, and the inhabitants of a district had the same right to appear in opposition. The Act 28 Vict., c. 27, was specially passed to meet cases where public authorities felt it their duty to oppose bills, giving power to committees of both Houses of Parliament to recoup them the expenses to which they might be put in so doing. It was called "An Act for Awarding Costs in certain cases of Private Bills," and the first section provided that "when the committee on a private bill shall decide that the preamble is not proved, or shall insert in such bill any provision for the protection of any petitioner, or strike out or alter any provision of such bill for the protection of such petitioner, and further unanimously report with respect to any or all of the petitions against the bill, that such petitioner or petitioners has or have been unreasonably or vexatiously subjected to expense in defending his or their rights proposed to be interfered with by the bill, such petitioner or petitioners shall be entitled to recover from the promoters of such bill his or their costs in relation thereto, or such portion thereof as the committee may think fit, such costs to be taxed by the taxing officer of the House as hereinafter mentioned, or the committee may award such a sum as they shall think fit with the consent of the parties affected." Now, it was not for a moment contended that such costs were granted to the Corporation of St. Helen's by the committee of the House of Lords, or that any case was made out before the committee which showed that the bill injuriously affected the rights of the corporation. If they had made out so strong a case before the committee as to justify it, they would have had their costs awarded them.

The VICE-CHANCELLOR: Do you mean to say that the members of the corporation should have applied their own private moneys to this purpose, and then taken their chance of getting it back again from the company? I thought your argument was that this was a breach of trust, and a misapplication of the borough fund.

Mr. MICHAEL: My argument is, that it is illegal to apply the borough fund, which is the only fund they have at their disposal. We do not seek to restrain their opposition; we did not oppose their *locus standi*.

The VICE-CHANCELLOR: "*We*;" I thought you were for the relators. Are you for the gas company? However, you did not intend that.

Mr. MICHAEL: We cannot help to some extent identifying ourselves with the company.

The VICE-CHANCELLOR: As the matter proceeds, I think you cannot help identifying yourself with them. However, you must do the best you can for your clients.

Mr. MICHAEL said it was, of course, a matter of great interest to the gas company that the opposition should be prevented, but it was also a great matter to the ratepayers that their money should not be illegally expended in opposing the bill. The corporation at the present time were in this position—that either they had no surplus of the borough fund, or that they had made a rate illegally, because by their Act no rate could be made until the fund was expended. By their Act this fund was applicable to specific purposes, and when those purposes were accomplished the surplus was to be devoted to the general benefit of the inhabitants. Was it for the general benefit that the rates charged for gas should be reduced? There was no question it was of great benefit that gas should be supplied cheaply, but the same thing might be said with regard to all the neces-

saries of life, and yet it could not be said that the corporation might employ their surplus fund in effecting a reduction in that direction. And then it must be remembered that only a limited number of the ratepayers were consumers of gas, and it would be clearly illegal to employ the borough fund for the benefit of a section only of the community. And beyond this the Gas-Works Clauses Act, incorporated in the bill of the St. Helen's Company, gave the public all the protection which the Legislature considered needful; while the contract which the corporation had with the company for the public lamps secured to them the most advantageous terms for the gas supplied to them. They had, therefore, failed to make out a case calling for their interference in the matter. Then with reference to the extension of the limits of the company, it must be remembered that at the time the Improvement Act was passed the area over which they supplied gas was twice that embraced by the jurisdiction of the corporation, and if the argument against any further extension was sound, it must go the length of saying that the company could not lay down a single new main (although the corporation had power to call upon them to do so) because it would enhance the value of the undertaking, and stand in the way of the corporation ultimately becoming the purchasers. In conclusion, he submitted that the corporation had gained nothing by their opposition in the Lords, and that it was an illegal expenditure of the borough fund, which was only applicable for the general good of the public, to expend it in carrying on a useless opposition in the House of Commons.

Mr. GREENE rose to state the case on behalf the defendants, but was stopped by——

The VICE-CHANCELLOR, who said: I will not call upon you, because I think the relators have failed to show cause for the interference of the court. There can be no doubt of the jurisdiction of the court. There is no doubt that, as in the Norwich case, where a corporation are applying the borough fund for purposes to which it was not properly applicable, and are therefore committing a breach of trust, this court can interfere, and prevent that breach of trust. But I apprehend the court will only interfere in cases where the breach of trust appears perfectly clear, and is established by satisfactory evidence. In the present case what is alleged is that, looking at the provisions of the Act which constituted this corporation, no substantial benefit can be gained by the corporation by opposing the bill now in progress through Parliament. If it appeared clearly that there was a wanton opposition, without any colour of benefit at all, I think it would be the duty of the court to interfere. The case of opposing a bill in Parliament is, in some respects, different to a case like the Norwich case, where the court was asked to interfere to prevent the application of the borough fund to the promotion of an Act of Parliament. Here it is said that no practical benefit can accrue to the corporation from opposing this bill. It appears, however, that by the Act which constitutes the corporation and creates the borough fund, and governs the borough, there is an authority given on the important subject of lighting the town, and of purchasing the works of the gas company. I apprehend there can be no doubt that the clauses there introduced were so introduced with a view to the benefit of the public. There is another clause—the 377th—which restricts the amount of money which can be raised for the purpose of effecting that purchase. Putting these two things together, if there is passing through Parliament a bill, the effect of which, and the condition in which it appears to be promoted, is such as that the clauses which authorize the purchase of these works may be interfered with, it is impossible to say that it is an unreasonable thing for the borough not only to watch the progress of that bill, but even to oppose it. At the same time, it is impossible not to feel the truth of what Lord Campbell says—that in opposing bills, as well as in promoting them, where the funds of a corporation are sought to be applied to that purpose, there is great danger of jobbery arising. Proceedings before Parliament for private bills are a sort of litigation, because committees of Parliament act as judicial bodies, and it is a kind of litigation which eminently, in my opinion, requires the superintendence of the courts of justice in order to assist Parliament in doing what ought to be done for the purposes of justice, and preventing any parties resorting to Parliament for purposes which are inconsistent with what is just and right. In this case, looking at the evidence of the town-clerk, which fully states what has taken place, and looking at the fact that there was a meeting of the ratepayers, at which a resolution was unanimously passed to oppose this bill, it is impossible for me to say that this court ought to interfere, and grant an injunction.

Motion dismissed with costs.

Miscellaneous News.

CHARTERED GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting of the Shareholders of this Company was held at the Offices, Horseferry Road, Westminster, on Friday, May 27, "to authorize the creation and issue of debentures for £62,500, and to consider and, if approved, to confirm the scheme for the amalgamation of the Great Central Gas Consumers Company with this company, if and as settled with the Board of Trade." The chair was occupied by the DEPUTY-GOVERNOR, the Hon. Richard Howe Browne.

The SECRETARY (Mr. J. O. Phillips) having read the notice convening the meeting,

The DEPUTY-GOVERNOR said he had to express to the shareholders the regret of the board at the absence of the governor on that occasion through indisposition. Mr. Beck had been advised to take a little relaxation from business, with a view to recruit his health, and it was earnestly hoped that in a short time he would be able to resume his duties in connexion with the company. The first matter which claimed the attention of the meeting was the proposed issue of debenture stock to the amount of £62,500 under the provisions of the Act of 1868, which they were authorized to raise on payment of the first calls on the £250,000 preferences shares. The proposal might have been made at the last meeting, but unfortunately one or two of the shares held on trust had not then been paid upon, and therefore the board could not authorize the secretary to make the necessary affidavit. That, however, was now done, and in asking the meeting to pass a resolution authorizing the directors to issue these debentures, he would state what he knew would be very satisfactory to the meeting—that the whole £62,500 had been taken up by one large insurance company, at what the directors considered a fair and equitable rate of interest—viz., 4½ per cent. He moved—"That there be created and issued further mortgage debentures to the extent of £62,500, as authorized by the Gaslight and Coke Company's Act of 1868, at such periods, upon such terms, and under such conditions and provisions as the directors shall from time to time determine."

Mr. GRAY, in seconding the motion, said he thought the directors had made a very advantageous arrangement, and he might add to the statement of the deputy-governor that £30,000 of the money was borrowed for five years, and the remainder for seven years.

The DEPUTY-GOVERNOR, in reply to an inquiry by Mr. Rhodes, said the company had already paid £500,000 to the contractors on account of the new works.

The motion was put, and carried unanimously.

The DEPUTY-GOVERNOR said the next subject for consideration was the scheme for the amalgamation of the Great Central with this company. At the last meeting the directors promised that if it were in their power they would have copies of that scheme circulated among the shareholders before they were called upon to discuss it. He was sorry to say that, owing to the domestic affliction of Mr. Farrer, the secretary of the Board of Trade, to whom the matter had been principally intrusted, the directors were not officially in possession of the scheme with the few amendments suggested by the board. Mr. Phillips had, however, seen those amendments, and he would tell the meeting that they were of the most trivial nature, and that they contained nothing to which the directors could object. In fact, they were but two in number. In the first place, the board required that the mode of paying off the Great Central defalcation account should be more clearly defined by words than it was in the scheme as last before the shareholders, showing that it was to come from the dividends of the united company, and not out of the pockets of the gas consumers. That was always the intention, and the directors had not the slightest objection in accepting this amendment. The other amendment was one giving power to the directors, out of their fees, either to superannuate or buy out any member of the board who wished to leave the direction. It was very obvious that when three large companies were amalgamated, the united boards would necessarily be an unwieldy body, and the proposal to buy out any who might retire would not impose any increased burden upon the proprietors, because the sum to be paid to the directors had been defined and agreed to.

The SECRETARY, at the wish of two or three shareholders, read over the scheme as last presented, and pointed out the clauses in which the Board of Trade amendments occurred. Besides the two referred to by the deputy-governor, he said there were some verbal alterations in other clauses, but none which affected the general scope of the scheme.

The DEPUTY-GOVERNOR moved, and Mr. GRAY seconded, the following motion, which was unanimously adopted:—"That the amalgamation with the Great Central Gas Consumers Company with this company be approved, and that the scheme for the amalgamation as now read be confirmed and adopted, subject to such alterations, at the suggestion of the Board of Trade, as the directors may approve."

Mr. LAVANCHY asked what progress had been made with the bill for enabling this company to purchase the undertaking of the Victoria Docks Gas Company.

The DEPUTY-GOVERNOR said he was happy to state that the bill was read a third time in the House of Commons on the previous night. He might also state that the new works at Beckton were proceeding in the most satisfactory way, and the directors had the assurance of their engineer that towards the end of September, or the beginning of October, the company would be in a position to manufacture gas there; in fact, a great number of retorts were already set. He had further to mention, that he hoped before the next meeting of proprietors the room in which they were accustomed to assemble would be made more convenient for the purpose.

A vote of thanks to the directors for their able management, and to the Hon. R. H. Browne for his conduct in the chair, was then adopted.

The DEPUTY-GOVERNOR appropriately acknowledged the compliment, and the proceedings terminated.

DUNDEE GAS COMMISSION.

The following are the accounts of the Dundee Gas Commissioners, from April 30, 1869, to April 30, 1870:—

1.—REVENUE ACCOUNT, *for the Year ending April* 30, 1870.

Coal account, including fireman's wages	£20,323	3	8	Gaslight account	£35,686	17	2
Purifying account	776	5	2	Meter-rents	1,770	13	11
Main-pipe account	167	8	10	Coke account	1,485	1	2
Service-pipe account	308	6	0	Chemical products account	4,104	2	8
Meter account	1,185	11	0				
Retorts and setting, tools, &c.	670	7	11				
Repairs of buildings and gas apparatus	566	9	6				
Rents, feu duties, &c., less rents received	575	11	2				
Interest on mortgages, less interest received on bank account	1,318	19	2				
Expense of loans	5	14	9				
Assessments, taxes, &c.	1,067	11	4				
Salaries, including cost of collecting revenue	1,529	14	4				
Stationery, printing, &c.	153	15	4				
General expenses	96	16	6				
Annuities	8,662	10	0				
Sinking-fund	1,000	0	0				
Depreciation and capital expenditure account	1,000	0	0				
	£39,408	4	8				
Balance, being surplus revenue	3,638	10	3				
	£43,046	14	11		£43,046	14	11

2.—GENERAL ACCOUNT.

Dundee Gas Act, 1868	£5,735	14	2	Amount borrowed on mortgage	£40,000	0	0
Dundee gas valuations	30,585	1	6	Clydesdale Banking Company—Amount overdrawn	5,203	15	10
New gas company's mortgages	18,119	4	7	Unsettled accounts—Amount due for coals, stores, &c.	7,488	6	3
Outstanding accounts—Amount due to commissioners for gas, secondary products, &c.	5,058	5	7	Deposit account	124	6	3
Stock on hand—Value of coals and stores per inventory	2,797	19	11	Sinking-fund	1,500	0	0
Property and income tax	23	6	10	Depreciation and capital expenditure account	389	7	6
Cash—Balance in hands of treasurer	59	14	8	Revenue account—Balance, April 30, 1869	4,035	1	2
				Balance, April 30, 1870	3,638	10	3
	£62,379	7	3		£62,379	7	3

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary Meeting of Proprietors was held at the Terminus Hotel, Cannon Street, London, on Tuesday, May 31—P. TWELLS, Esq., in the chair.

The SECRETARY (Mr. A. F. Jackson) read the notice convening the meeting, and the corporate seal was affixed to the register of shareholders.

The following report was presented:—

The present half-yearly ordinary meeting of the shareholders has been convened agreeably to the company's Act of Parliament, for the purpose of receiving a report from the president and directors upon the affairs of the association, and for declaring the dividend for the half year ended the 31st of December last.

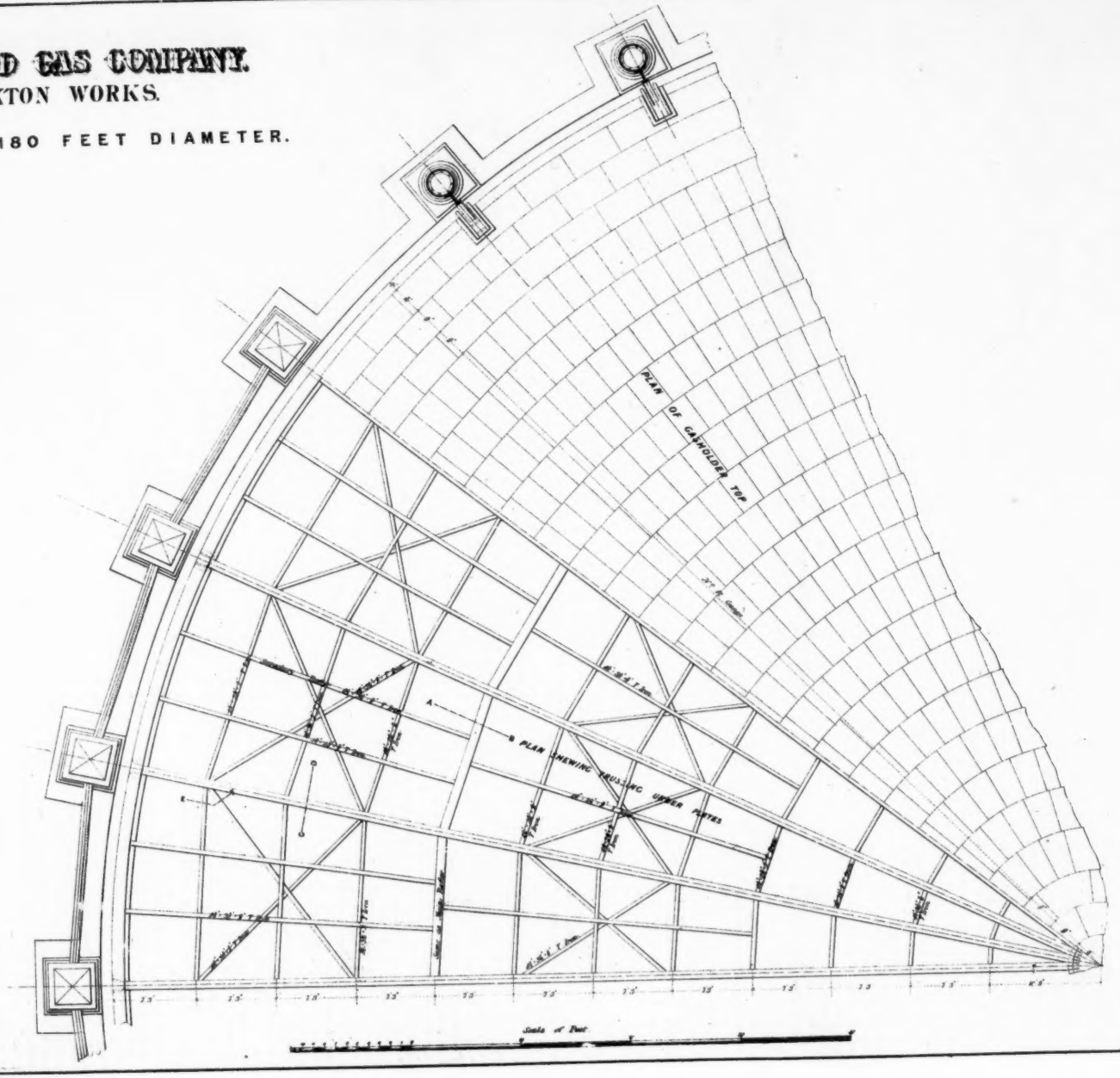
During that period the workings of the several stations, and the business of the association generally, have continued satisfactory. The total quantity of gas made in the half year now under consideration was 2025 millions of cubic feet. The total quantity made in the corresponding half year of 1869 was 1882 millions of cubic feet. These figures show an increase of 143 millions, or of about 7·6 per cent. The total number of lights at all the stations on Dec. 31, 1869, was 808,083. The total number on Dec. 31, 1868, was 755,281, being an addition of 52,802, or an increase of about 7 per cent. The rental for the six months now under consideration is greater than it was in the corresponding six months of 1868. The value also of the secondary products—coke, tar, and ammonia—has satisfactorily improved.

These particulars show the results of the workings at the various stations, and justify the directors in again offering a well-merited compliment to the skill, zeal, and attention of Mr. Drory, and the several engineers and officers acting under his general superintendence.

CHARTERED GAS COMPANY.

BECKTON WORKS.

GASHOLDER 180 FEET DIAMETER.



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With regard to Berlin, as it was with regret that the directors had, in several previous reports, to announce the existence of litigation with the magistrates, so it is with pleasure that they have now to inform the shareholders that those disputes have come to an end. The respective rights are now clearly defined, and the association is working harmoniously with the town.

New tanks and gasholders will shortly be in course of erection at Antwerp, Berlin, Bordeaux, Cologne, and Frankfort-on-Maine. At Vienna, to meet the increased demand for gas created by the recent large reduction in price, it has become necessary to construct two additional works, for which the land has already been purchased. With regard to Berlin, land has been purchased at Schöneberg for a third establishment. At Bockenheim, near Frankfort-on-Maine, and also at Lille, new works are now in process of construction. These new establishments, and the maintaining in efficiency and extending the present works, necessitate a considerable expenditure.

From the accounts for the half year ending the 31st of December last (which have been duly audited), the president and directors have, in accordance with the provisions of the Act of Parliament, prepared the scheme for the dividend and bonus now to be declared—namely, a dividend of £2 10s. per share, and a bonus of £1 10s. per share, making together an apportionment of £4 per share, payable, free of income-tax, on and after the 15th of June next.

The directors who go out of office by rotation are John Wilkin, Nathaniel Montefiore, and Julian Goldsmid, Esqrs. The auditor who goes out is Thomas Newton Stokes, Esq. These gentlemen are all eligible for re-election, and offer themselves accordingly.

The CHAIRMAN: Gentlemen, the transactions of the association for the half year which terminated on the 31st of December last were not marked by anything of particular interest or importance. The report which you have just heard conveys all the information we think it is at all material to place before the general body of shareholders. The results of our transactions have not been altogether discouraging, although our profits for the half year were rather smaller—by a few thousands—than for the corresponding period of 1868. This, however, we were quite prepared for, as it has been the almost invariable consequence of a large reduction of price at any of our chief stations. In the spring of last year we made a considerable reduction of price at Vienna—no less than 1s. per 1000 cubic feet—which in so large a place is a very material consideration, naturally causing a large falling off in the rental, and of course a corresponding falling off in the profits at that station. This has, however, been partially made up, as far as the present half year is concerned, by a very great increase in the consumption, and I have no doubt that in a few years our profits in Vienna will be as large, if not larger than they were before. At the same time, this inconvenience always arises in connexion with a reduction of price, that it creates a necessity for increased gasholder room and extensions of mains, which, of course, causes a drain upon our resources to a considerable extent. So far as Vienna was concerned, we had provided for the necessary outlay last year, and I trust there will be no difficulty in meeting any further expenditure which may be essential. I think Vienna was the only place where anything material occurred last half year, and it is satisfactory to find that, in spite of the reduction in price made there, our profits altogether enable us to recommend to the shareholders that the dividend payable on the last occasion should not be diminished to-day. I have only now, gentlemen, to offer a few words with regard to the present half year's transactions, to which reference is not made in the report; and, in the first place, I have to state that our contract at Frankfort having nearly expired, we have, as usual, endeavoured to come to an arrangement with the municipal authorities before that contract had entirely run out. We have had considerable negotiations with them, and I think I may say that they have tried to drive a very hard bargain with us—at all events they certainly endeavoured to protect the interests of their constituents to the utmost—and we have at last completed another contract on terms which we believe are very beneficial to the town. At the same time, as we have had experience of the working there, I have no doubt that, with the increased consumption, the price at which we shall supply gas at Frankfort in the future will yield us a remunerative return. At Vienna, during the present year, we have made preparations for the lighting of some of the suburbs. This has necessarily caused a considerable delay, and a still larger expenditure will be required, but we have endeavoured to provide for this, and I trust the investment of our capital will not be unprofitable. It will be in the memory of many of the shareholders now present, that on the 1st of February last we convened a special meeting to authorize the board to apply to Parliament for a new Act. In accordance with the authority then given application was made for a new Act, in which we sought to capitalize £1,225,000 from the fund we had set aside to meet contingencies and provide for extensions. That appeared to be a larger sum than was ever so authorized by any Act of Parliament before, and the Chairman of Committees of the House of Lords raised—not unnaturally, I may say—some considerable objections in acceding to the provisions of the bill. Our position, however, was a very peculiar one, and we had not much difficulty in satisfying him that the whole amount and more had been really expended upon extensions of works. The Chairman of Committees being—as I believe he always is—very reasonable, when a case is fairly and properly laid before him, granted our request, and gave us permission to capitalize the whole of the money, so that the wishes of the shareholders will be carried out. Our bill was read the third time last night, and now only waits the Royal Assent, consequently this is the last meeting which will be held under our existing Act. The bill, as I said, gives us what we asked for—with one exception. It gives us the privilege of capitalizing the whole £1,225,000, but Lord Redesdale could not be prevailed upon to concede to us the right of crediting to the shares in future the sums which hereafter might be carried to our contingent-fund. He thought this was too large a demand after giving us the right to capitalize a million and a quarter. On that one point our application failed; on all the other points we succeeded, and I hope our new Act will work beneficially. I should say that it authorizes us to raise, with the consent of a special meeting, further capital to the extent of £700,000, and to borrow on debentures, if it is thought needful, the sum of £300,000. We have already had some small sums borrowed on debenture, which we are endeavouring to pay off as rapidly as possible; but the power to create that loan was loaded with the disagreeable obligation that we were required to keep as large an amount uncalled as we borrowed on debentures. In the new Act we avoid that. It was thought that with the large income of £300,000 a year the borrowing powers we asked for might safely be exercised without keeping capital uncalled. I think, gentlemen, these are the only provisions of the bill with which I need trouble you. With regard to the working out of the new arrangements, it may be convenient that you should know what our plans are. We propose, first of all, to give notice to the shareholders that the books of the company will be closed for a fortnight in July, and during that time we shall be prepared to allot to each shareholder two shares for each existing share. Another notice will then be given to the shareholders that certificates are ready, and they will be sent or given to them, as may be most expedient. Every proprietor of one share will thus have two, and I hope, as I before said, that the Act will be followed by beneficial consequences. At the same time, on that point, I think I am rather bound to say, on the part of the directors at large, that they have never been able to see that the bill is fraught with that amount of benefit which some shareholders expect to derive from it. We quite approve of the bill, and think it offers great advantages, because it places our position with regard to capital in a more straightforward and true light than ever before. But we must always recollect that it does not add anything whatever to our power of producing gas or getting better prices, nor will it in any way necessarily or directly add to our profits, and it is chiefly from the amount of profits that the real value of our shares is increased. I hope some of the expectations cherished by the most sanguine among our shareholders will be realized, but I cannot bring myself to see such large advantages as I know are expected from it by some members of the association. Gentlemen, I will not detain you, but beg to move, in the absence of our esteemed president, Sir Moses Montifiore—"That the report now read be received and adopted."

Mr. TURNER seconded the motion.

Mr. PRICE expressed the satisfaction he felt that the time had arrived when the directors and the great body of the proprietors were entirely in accord, and he congratulated the meeting that they had placed the affairs of the association on a legitimate and true basis. By the course which had been adopted in regard to the new Act, they had obtained a real representation of the amount laid out upon the works. The Act placed them before the public as they really were, and by dividing the shares the opportunity would be given for the public to come in.

The motion was put, and carried unanimously.

The CHAIRMAN moved—"That a dividend of £2 10s. per share, and a bonus of £1 10s. per share, making together an apportionment of £4 on the 28,000 shares of the association, be declared for the half year ending Dec. 31 last, and that the same be payable, free of income-tax, on and after the 15th of June next, as recommended in the report."

The motion was put and carried, and the retiring directors and auditor were re-elected.

Mr. PRICE moved a vote of thanks to the president and directors for their able management of the affairs of the association, and to the chairman for his conduct in the chair.

Mr. BARBER seconded the resolution, which was cordially adopted.

The CHAIRMAN: Gentlemen, I beg, on behalf of our absent president and of my colleagues present, as well as on my own behalf, to thank you most cordially and sincerely for the vote just come to. Of course you are all aware that a great deal of attention is required on the part of the directors, which is always most readily given; but that attention would never be followed by good results if we were not ably supported by the skill, energy, and devotedness of the officers of the company, to whom all praise is due.

METROPOLITAN ASSOCIATION OF MEDICAL OFFICERS OF HEALTH.

At the last Meeting of the Session 1869-70, held at the Scottish Corporation Hall, Crane Court, Fleet Street, on Saturday, May 21—Dr. ALDIS in the chair, Dr. LETHEBY read the following paper:—

ON THE PRESENT PROSPECTS OF THE SEWAGE QUESTION, IN RELATION TO THE PUBLIC HEALTH;

With a Brief Review of the First Report of the Commissioners appointed in 1868 to Inquire into the best Means of Preventing the Pollution of Rivers.

Hasty and inconsiderate legislation, promoted by those who, as the sequel will show, had no real knowledge of either the principles or practice of the subject with which they officiously meddled, together with the most mischievous charlatanism, has brought the whole question of the disposal of sewage into such a frightful mess, that the public are not only loud in their complaints of the injury inflicted on them, but are equally emphatic in their demands for a remedy.

A review of the parliamentary history of this subject would be instructive, and it would also be amusing, but for its serious results and its solemn prolixity; for it would show how Blue-Book upon Blue-Book, and report upon report, from the same officious hands, and in the same wearisome tone and bewilderment of facts and figures, had so perplexed the Legislature, that they were glad to dispose of the subject by hasty legislation, or by handing it over to some Royal Commission, not always discreetly chosen.

But bad as are the consequences of this, the prospects of the future are worse, for there is a well-grounded fear that the same incompetent school of sanitarians, who have been concerned with our present difficulties, will also be concerned with the future, and that Parliament will again have to correct the errors of inconsiderate legislation. If this can be prevented it will be of vast importance to the public, and none are better able to assist in the matter than the health officers of this metropolis. It is with this object I draw your attention to it, and ask you to give it your serious consideration.

In the first place, let us inquire what is the nature of the thing we have to deal with. Sewage is at all times a very complex material, for it is composed not only of the solid and liquid excreta of the population, but also of the fluid refuse of every branch of industry—as the filth of kitchens, laundries, and dye-houses; the drainings from stables, slaughter-houses, and the public markets; the various liquid impurities of trades and manufactures; and the washings of streets and alleys. These, with the ejecta of the inhabitants, and a large volume of water, compose the sewage of towns. But each of these constituents has its specific influence on the composition of the general mass, and on the putrefaction to which it is subject. Every town or city, therefore—in fact, every part of a city has its own peculiar quality of sewage, varying with the density of the population, the habits of the people, as to their diet, cleanliness, and trade pursuits; with the season of the year, the state of the weather, the day of the week, and even the hour of the day. This makes it difficult to obtain precise information of the nature and composition of sewage. Nevertheless, there are two ways by which the subject may be approached—as by ascertaining the average amounts of solid and liquid matters contributed by each individual, and by the various branches of industry; and, secondly, by making careful analysis of the sewage collected throughout the day at various seasons of the year.

Messrs. Lawes and Way in this country, and MM. Wolf and Lehman on the Continent, have determined, with very nearly the same results, the average proportions of solid and liquid matters discharged daily from the human body. It varies, of course, with age and sex, but broadly it may be said that, taking a thousand individuals, at all ages, as they are found in a population, they contribute about 2640 lbs. of liquid and moist excreta. In the dry state it would amount to about 141 lbs. This is at the daily rate of 42·25 ozs. of moist, or 2·25 ozs. of dry matter per head of the population. The washings of streets have been carefully examined by Professor Way, who finds that the liquid discharged into the gullies, after a heavy shower of rain, contains, in the case of granite roads, about 813·3 grs. of solid matter per gallon, and of this 276·2 grs. are dissolved, and 537·1 grs. suspended. In that of wood pavements it contains only about 39 grs. per gallon, of which 34 grs. are dissolved, and 5 grs. suspended. The general average of the washings of several streets differently paved, and with various amounts of traffic, gave 262·6 grs. of solid matter per gallon, of which 113·3 grs. were dissolved, and 149·3 grs. suspended. The refuse of factories, &c., cannot be easily determined, and therefore we are obliged to rely for our results on the second method of investigation—namely, the analysis of the sewage at different times and place.

In this metropolis the sewage discharged by day contains about 94 grs. of solid matter per gallon, of which 38 grs. are suspended, and 56 grs. dissolved: of the suspended matters, 17 grs. are organic, and 21 grs. mineral; and of the dissolved, 15 grs. are organic, and 41 grs. mineral. The night sewage is not so rich in solid elements, for it contains only about 79 grs. of solid matter per gallon, of which 14 grs. are suspended, and 64 grs. dissolved; and of these, 15 grs. are organic, and 64 mineral—the organic being distributed very evenly between the soluble and insoluble constituents.

Branch sewers, and those which are nearly stagnant, are generally very foul, for the sewage of them contains from 150 grs. to 500 grs. of solid matter per gallon, of which from 90 grs. to 250 grs. are suspended. The organic matter ranges from 20 grs. to 120 grs. in the soluble part, and from 20 grs. to 176 grs. in the insoluble.

Taking the average of all the results obtained in the examination of the metropolitan sewage by Dr. Hofmann, Mr. Witt, Professor Way, and myself, it may be said that it contains about 90·4 grs. of solid matter per gallon, of which

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about 29·8 grs. are suspended, and 60·6 grs. dissolved, there being about 15 grs. of organic matter in each of these constituents.

A storm of rain does not diminish the proportion of solid matter, for although it has a tendency to dilute the sewage, yet it washes away so large a quantity of filth from the streets, and disturbs so much of the sediment in the stagnant sewers, that the sewage after a storm generally contains more than the average proportion of solid impurity. Taking 90 grs. per gallon as the usual amount, it will be increased after a storm to 125 grs. per gallon, of which 64 grs. are suspended, and 61 grs. dissolved.

The physical properties of sewage are peculiar, for when examined under the microscope the clear liquor is found to contain a large quantity of amorphous organic matter, with filaments of various fungi, and it swarms with the lower forms of animal life, as beaded *spirulina*, *vibriones*, and *monads*; but soon after exposure to the air higher forms of infusoria appear, as *paramecium*, *vorticella*, *rotifera*, &c. The sedimentary matter consists of the remains of undigested food, as muscular fibre, husk and hair of wheat, the cells and starch of potato, and the tissues of vegetables, as cotton, cabbage, &c., and fibres of wool. It also contains the products of some of the secretions, as yellow biliary matter, intestinal mucus, and crystals of uric acid and triple phosphate; besides the *débris* of the streets, as particles of granite, flint, and carbonate of lime, with a large quantity of black amorphous matter.

When sewage has a very offensive odour, and is evolving marsh gas and sulphuretted hydrogen, it rarely exhibits much sign of animal life, but when it is diluted with water and exposed freely to the air the bad odour quickly disappears, and the higher forms of infusoria are rapidly developed. This is proof of the salutary influence of air and water in promoting the less hurtful kinds of decay. I have often noticed that where the sedimentary matters of sewage accumulate and putrefy, without free access of air, foul gases are evolved, and little or no organic life, except of the very lowest kind, appears. This was formerly the case with the mud upon the banks of the Thames, where the only living things were *monads*, *vibriones*, and *fungi*; but in the middle of the stream, where there was abundance of air and water, the highest forms of infusoria abounded. This may be noticed in every river of the kingdom which receives the sewage of a large town. At first, the sedimentary matters deposit and putrefy; but the supernatant water, containing all the soluble constituents of the sewage, passes on, and rapidly becomes clearer and clearer, until its organic matter is appropriated by living beings or destroyed by oxidation. This process is not only indicated by the marked improvement in the appearance and odour of the water, but it is actually demonstrated by the character of the vegetation, which passes successively from the simplest and lowest forms of fungi to *conferva*, *calothrix nivia*, *vaucheria*, &c., until at last *anacharis*; *nasturtium*, *veronica*, &c., abound; and when these are clean and healthy we may be assured that the sewage, in its noxious condition, is no longer in existence, and that the most refined skill of the chemist will fail to discover it.

I have, on a former occasion, fully discussed this important question, and I should not again refer to it if it had not been made a special subject of comment, and apparently of exerimental inquiry, by the Rivers Pollution Commission; for at page 18 of their recent report they say: "It has often been stated, but so far as we know without proof, that the organic matter contained in sewage and other similar polluting materials is rapidly oxidized during the flow of a river into which such materials are discharged. Thus, it has been asserted (Report of Royal Commission on Water Supply, p. 79) that if sewage be mixed with 20 times its volume of river water, the organic matter which it contains will be oxydized, and completely disappear whilst the river is flowing 'a dozen miles or so!'" Now, I think it is right to state that the quotation is not fairly made, and that the sense and substance of my evidence herein allnded to are not fully expressed; for on referring to the page from which the Rivers Pollution Commissioners have quoted, it will be found that I spoke of oxidation as only one of the agencies concerned in the destruction of organic matter in a running stream. My words are these: "Considering the powerfully oxidizing influence of water upon sewage, the many agencies which are at work destroying it, the power of precipitation, the using of it up by vegetable and aquatic plants and by fish, and above all by the power of oxidation, I think none of the sewage discharged into the Thames can at the present time be discovered at Hampton;" and when I am asked how far it would have to flow before it would be broken up into other chemical compounds, I answer thus: "I have made a great number of chemical experiments to determine that. I have examined most of the rivers in England, and this is the conclusion that has been come to, not only in my mind, but in the minds of all the engineers who have devoted their attention to the subject—that if ordinary sewage, containing we will say nearly 100 grs. of solid matter per gallon, such as London sewage, out of which probably something like 14 grs. or 15 grs. are organic, be mixed with 20 times its bulk of the ordinary river water, and flows a dozen miles or so, there is not a particle of that sewage to be discovered by any chemical process." I ought perhaps to have said by any *reliable* chemical process; for I will not answer for the results of such processes as are used by Dr. Frankland for the determination of "organic carbon" and "organic nitrogen"—processes that I have already criticized, and which others have declared to be so faulty, that the range of error embraced by them is greater than the range of possible truth. It is curious, however, that even with these processes the Thames at Hampton, according to Dr. Frankland, is purer than the Thames at its source, notwithstanding that it has received the drainage from all the towns on its banks.

But to return to the subject, the Pollution Commissioners say: "We thought it very undesirable that a subject of such vital importance to our inquiry should any longer rest upon mere opinion, and we therefore determined to submit it to careful experimental investigation." Their investigations were of two kinds—namely, an examination of the Mersey, the Irwell, and the Darwin, at different parts of their course, choosing the winter time, when most of the agencies to which I have referred were dormant; and, secondly, by examining air and sewage contained in a bottle. Both of these investigations were of the most unsatisfactory kind; for from what I know of the rivers in question, there is no part of their course so free from the access of impurities as to furnish even remotely the sort of evidence upon which we can rely. The evidence, however, which they do furnish is that, notwithstanding a continued access of impurity, there is a continued improvement of their condition; and as for the experiments with sewage in a bottle, they are so absurdly ridiculous, as a means of testing so important a question, that I am ashamed to refer to them. The proper way in which such an inquiry should be conducted is an appeal to the large facts of nature; for everywhere the rivers of England are receiving the sewage of towns, and yet they are everywhere undergoing a rapid self-purification. If this were not so, their condition would be frightful, and we should expect a universal pestilence. In this metropolis, for example, the water which we drink is taken from the Thames after it has received the sewage of thousands of people, and yet, to use the words of Dr. Frankland, "it is purer and better adapted for domestic purposes at Hampton," where it is taken, "than at any other part of its course." And how has this been effected but by oxidation, and by the operations of animal and vegetable life. When Dr. Miller was asked by the Royal Commissioners on Water Supply, whether he had made any experiments on the power of water, in a given course, to oxidize organic matter, he said, "I ascertained a remarkable result in 1859 upon the river. I took specimens of the water at Kingston, at Hammersmith, at Somerset House, at Greenwich, at Woolwich, and at Erith on the same day, and examined the quantity of oxygen which the water contained at all these different points. I found that the quantity of oxygen at Kingston was the ordinary or normal proportion; at Somerset House it was much diminished, at Greenwich the whole of the oxygen had disappeared, at Woolwich it was in much the same condition, and at Erith the water was very much improved, showing that this diminution of oxygen had been produced by its action upon the water contaminated with the sewage of the London district, and that, as it passed lower down, the oxygen was again absorbed from the air, and again it became diluted with a large volume of water from below, from other sources—the Lee, the Ravensbourne, and other tributaries—and in this manner the water had again become oxidized. I look," he says, "upon this as *a direct proof of the effect of oxygen in destroying those organic contaminations which are thrown into the river*." Dr. Odling, also, in reply to a question from the Royal Commissioners, as to the self-purifying power of water, said: "You see in many rivers, even sluggish rivers, having sewage discharged into them, that for a mile or two the appearance of the river is affected by the sewage, but beyond a certain distance there is no recognizable effect at all—the weeds are perfectly clean and perfectly healthy;" and he instances the river Soar, at Leicester, which is black and very foul from the refuse of the town; but "three miles from the town its appearance is such that you could not tell it had been contaminated, for it was running clear, with fish swimming in it, and the weeds were clean." That, he said, was simply from a process of self-purification. Again, Dr. Taylor, of Guy's Hospital, in his examination before a committee of the House of Commons on the Metropolis Water Supply Bill, states, when speaking of the effect of water on sewage matter, that "all such substances are very rapidly decomposed and destroyed; the nitrogen is converted into nitric acid, and the sulphur into sulphuric acid, so that those fœtid and putrid substances which go into the Thames from London, when rolled about by the action of the water, containing an enormous amount of air, *are all oxidized and destroyed; within a certain limit they may be found, but still, after a very short passage, they are very soon indeed destroyed.* I believe," he says, "it is the opinion of every chemist who has considered the subject, that sewage matter does not remain as sewage matter in well aërated water, but all phosphorus, sulphur, and nitrogen are speedily destroyed by the oxygen of the water. Every 1000 gallons of water contain 46 gallons of oxygen, and that oxygen destroys all such putrescent effluvia. With water not exposed to the air, and not containing air, it is most offensive and unwholesome; but with water containing air, like the Thames, and exposing an enormous surface to the air in its daily motion, the effect is completely to obliterate every trace (of sewage matter) that a chemist can detect. In the Thames and other water the air is in a state of solution, the matter in a state of diffusion, and thus the air and this fœtid matter are in the very condition to combine together and form an innoxious compound; it requires time and motion, but still it does take place with very extraordinary rapidity." And he concludes his remarks by saying: "The supposition that the drainage of London, which goes into the river about the bridges, remains the drainage of London all up the river, is contrary to all chemical experience; it is contrary to every chemical fact and every chemical analysis."

In a former communication to you I spoke of the investigations of Dr. Angus Smith on the polluted water of the Clyde, which were to the same effect. Engineers also, who have been largely concerned in such inquiries, have always spoken of the remarkable self-purifying power of water. Mr. Hawksley, whose experience of this matter renders him a very high authority on the subject, said, in answer to a question from the Rivers Commission, as to the quantity of water, compared with the volume of sewage discharged into it, as necessary for the purpose of breaking up the sewage into inoffensive compounds, that generally 20 to 1 was sufficient; but if the water flows rapidly, and is very much disturbed, so as to be continually receiving fresh oxygen, a smaller quantity—even 12 to 1—will effect the process; and if it proceeds very tardily it may take a little more, but 20 to 1 is abundant. "I could," he adds, "give you very remarkable instances of it. Take Sheffield. Nothing can be fouler probably than the state of the water at Sheffield, whereas if you go down to Doncaster (about 20 miles below Sheffield), the water is supplied by the waterworks, and is actually drunk in the town." Again, says Mr. Hawksley, "Take the river Irwell (the very river which Dr. Frankland has been examining). After leaving Manchester it receives the Irk, the Matlock, and all the refuse of the manufacturing population for a great many miles; when it travels down only eight or nine miles to Warrington it is perfectly changed; it ceases, or nearly ceases, in that short distance, to be an offensive river." "At Leicester, likewise," to use his words, "the water was as black as ink—nothing would live in it, and the smell was abominable; but by the time it had got to Loughborough (which is about 12 miles below Leicester) it was entirely restored to its pristine condition. You could stand on the bridge there and see the fish swimming amongst the beautiful ready and other plants growing in the water, just as in the purest stream. You could see every pebble at the bottom. That is an instance of oxidation." You may remember the instance which I gave you last year of the river Trent, which receives the sewage and manufacturing refuse of some of the largest, busiest, and dirtiest towns in the kingdom, with an aggregate population of more than a million and a half of persons, and yet when it arrives at Nottingham it is not only clear, pellucid, and inoffensive, with abundance of fish and aquatic plants, but it is actually used for the domestic supply of the town. But why need I multiply such instances, or dwell upon such self-evident empirical facts, when they are within the common knowledge and experience of everybody; for even Dr. Frankland is ready to admit, in the case of the London water supply, that "by gradual oxidation, partly in the pores of the soil, partly in the Thames and its tributaries, and partly in the reservoirs, filters, and conduits of the company this sewage contamination had been converted into comparatively innocuous organic compounds before its delivery to consumers."

"I believe," said Dr. Frankland, in his evidence before the Royal Commission on Water Supply, "that the noxious part in sewage is that which is held in mechanical suspension, not that in solution;" and no doubt the sedimentary matters of sewage are capable of producing an offensive condition of the rivers, for when they are discharged into a sluggish stream they quickly subside, and form accumulations of persistently putrefying mud. This is the chief cause of complaint wherever sewage enters a river.

At the time of the inquiry into the state of the Thames in 1858, it was admitted on all hands that the filthy mud-banks of the river were the great source of annoyance; and Dr. Hofmann and Mr. Witt, in their report of the matter to the Government referees, declared emphatically that the formation of this mud deposit in the bed of the river appeared to them to be by far the most serious evil which results from the discharge of London sewage into the river, and they strongly urged this point upon public attention. Dr. Odling, in his report to me on this subject, for the information of the referees appointed by the Metropolitan Board of Works, said that "any means which would prevent the deposition of organic mud in the bed, but more particularly on the exposed banks of the river, would effect an amply sufficient purification of it." The same was my own opinion, for in reporting to the referees I stated that the mischief produced by the discharge of sewage into the river "was not occasioned, as I once supposed, by the soluble matters of the sewage, but by the mud or insoluble constituents which settle and putrefy upon the banks of the river." These constituents being in a solid form, and not easily accessible to atmospheric oxygen, continue to putrefy for a considerable time. In my laboratory operations I have found that they will keep up a persistent decomposition, with a constant evolution of offensive gases, for many months, the air being excluded from them. I am therefore of opinion that the chief point to be aimed at in the purification of sewage is the rapid and effectual separation of its suspended matters, leaving the soluble matter to mix freely with proper proportions of running water, in which it will be quickly appropriated by infusorial life, or be destroyed by atmospheric oxidation; and this leads me to consider the means whereby this may be effected.

One method of accomplishing it is to keep the solid matters out of the sewage, as is practised with more or less success in Manchester, Salford, and other towns of Lancashire. In Salford, according to the report of the medical officer of health, Dr. Syson, the most satisfactory results have been obtained with a modification of M. Goux's plan, whereby the soil is received at once into tubs lined with some refuse absorbent; and the advantages of the plan, according to Dr. Syson, are that the manure becomes of great commercial value; that the excrement of the whole town can be readily removed at least once a week; and that in case of fever or contagious diseases the whole of the excrements can be readily and economically disinfected; besides which the plan is simple and economical. Earth-closets are not so manageable, as they require about 3½ times their weight of earth to the excreta, and the difficulties of carrying the material to and from the closets are not manageable on a large scale, although I have seen them in satisfactory operation in factories, as they may be in military camps, where the organization of labour is easy. Instead of earth, Mr. Stanford recommends charred seaweed, which is not only an excellent deodorizer, but does the work of three times its weight of earth. In Edinburgh in olden times there were no closets in the poorer houses, but there were numerous public privies, which still exist. These are provided with from 8 to 40 compartments, beneath which there is placed by the scavengers, every morning, a tin can, like the modern milk-can on the railways, and the can of the previous day, with its contents, is taken away. The soil is mixed with ashes and road sweepings, and sells for about £7000 a year, which is half the entire charge of the scavenging of the older part of Edinburgh. Nearly everywhere on the Continent some such method is adopted for the collection of the refuse and excreta, and they are profitably utilized. How far an improvement of this condition of things, instead of the present water-closet system, may have met the requirements of hygiène and the demands of agriculture, is an important question. The Pollution Commissioners, however, condemn this plan *in toto;* and so far are their views disturbed by the medium of their prejudices, that they cannot perceive any difference in the quality of the sewage of a place retaining its solid matters, and of another which lets them flow into the public sewers. Liverpool, for example, which collects and disposes annually of about 139,000 tons of privy soil; Manchester, 74,000 tons; Salford, 46,000 tons; Oldham, 50,000 tons; Preston, 30,000 tons; and Bolton, 22,500 tons, furnish in each case as much sewage, and of the same composition, as the towns which discharge everything into the sewers. The inconsistency of the thing is so striking that it creates most serious doubts of the accuracy of the analyses, and of the reliability of the determinations of organic carbon and organic nitrogen.

And now let us turn to the pet scheme of the Pollution Commissioners—the disposal of sewage in all places and under all circumstances by irrigation. Fortunately for us, the thing has been tried, and is now being done in many places, so that we can test it by its practical results, and examine it by the light of something more than that of abstract speculative chemistry.

To begin with its absolutely required conditions. You must have a soil that is sufficiently porous to allow the sewage to filter through it, and this soil must be well drained to carry off the subsoil water. The situation of the farm must be convenient as regards the flow of sewage to it by gravitation, and the discharge of water from it by drainage. It must not be within reach of danger from atmospheric miasms, or the pollution of wells by the subsoil drainage. It must have a ready market for the disposal of its only merchantable produce, green Italian rye-grass; and lastly, there must be an area of not less than two acres for every 100 people, one of these acres being actually in use while the other is resting to recover itself.

These conditions cannot always be secured, but even if they could, let us see if the objections to the process, on sanitary grounds, are not conclusively against it.

1. In the first place, the land irrigated with sewage is always a fœtid, swampy morass of the most offensive description. Nowhere, of all the places which I have visited, is there an exception to this condition of things. At the Craigintinny meadows, near Edinburgh, which I have often seen, the stink from them is hardly endurable—to use the words of Dr. Ligertwood, who was stationed at the neighbouring barracks, "the stench is sometimes quite sickening." At Norwood and at Beddington it is a subject of serious complaint by those who reside in the neighbourhood of the farms. I have myself experienced it on several occasions, and have been surprised at the statements of Dr. Carpenter, of Croydon, whose pet thing it is, that nobody complains of it. Mr. Creasy, the surgeon at the Female Orphan Asylum, at Beddington, tells a different story, for he says it so damages the value of the neighbouring property that the villas near the farm do not let so well as others, nor at so high a rent.

At Aldershot, which is frequently referred to as a well and successfully managed sewage farm, I ascertained, on a recent visit with Mr. Hawksley, Mr. Eggar, and Professor Ansted, from the occupants of the few cottages which skirt the farm, that the stench is frequently unbearable and most sickening. At Banbury there is but one house upon the estate; it is a public-house called the Bowling Green, and the landlady described to us, in very graphic terms, the nuisance she was obliged to submit to.

2. But these miasms are not alone offensive, they are also dangerous to the public health; in fact, the early proceedings of those who have brought about this condition of things were devoted almost entirely to the proof of their morbific action, and it was this apparently clear proof which was made the lever of their parliamentary movements, and was the main cause of our present difficulties. Now, however, they will tell you that the emanations from acres of land sodden with putrefying sewage are neither offensive to the senses nor injurious to the health. I put it to you, gentlemen, as a simple matter of common medical experience, whether you are of such an opinion; for, if so, where is the necessity for all our elaborate and expensive machinery for getting rid of these matters from our houses, and for preventing the escape of such offensive emanations? Why feel, in fact, the least concern for an untrapped drain or an overflowing cesspool? One of the highest medical authorities on the subject of fevers, Dr. Murchison, has traced a particular fever to this particular source, and has devoted a large portion of his classical work to the proof of sewer gases being the primary cause of what he has termed *pythogenic* or enteric fever. It is true that he has some doubts, like Dr. Christison, of the effects of the diluted gases; but time will prove whether these doubts are well founded. Already enough has been seen to show that they are not so harmless as many suppose. Mr. Creasy, to whom I have before alluded as practising at Beddington, said very recently, before a committee of the House of Commons: "I know the sewage farm belonging to the Croydon Board of Works, at Beddington, and have had experience in my professional capacity of what condition of health is around those flats, for I have known the district ever since it was a sewage farm. The first case of typhoid fever occurred in the place in 1867, and from that time to this there has been typhoid fever in every cottage on the estate; and I find around it that almost every disease assumes a particular type, accompanied with what we call a sewage tongue."

In the spring of last year I was inquiring into the condition of a stream called the Hebble Brook, which receives the sewage of Halifax, and I was informed that at a place near the outfall of the brook into the Calder, some of the sewage was distributed upon the land, and that it caused such a serious outbreak of typhoid fever in a neighbouring model village, belonging to Mr. Ackroyd, that it was found absolutely necessary to discontinue it.

Again, in the autumn of 1862, I had an opportunity of witnessing, on a very large scale, the morbific effects of sewer gases in the town of Shaftesbury, and the adjacent village of Enmore Green. The town had been recently drained by a gentleman of no great practical acquaintance with the subject, and he carried the sewage into the ponds and ditches around the town. It was an experiment of a very instructive kind, for soon the people were attacked with enteric fever, and in less than a year one-eighth of the whole population was down with the disease; for out of about 3500 persons, 448 were attacked. I am afraid, therefore, that these miasms, even when diluted with air, are capable of producing serious mischief, and that such facts are more conclusive than the statistics of Dr. Carpenter, which seem to show that the people of Beddington and Norwood have actually been better in health since the sewage was brought to them than before.

3. I would remind you that the efficacy of sewage irrigation is entirely dependent on the percolation of sewage matter, and the distribution of it through the subsoil water. It cannot but be, therefore, that this water is polluted to such an extent as to endanger the neighbouring wells. Many instances of this have already come under my notice; and it would seem, from the remarks of Dr. Carpenter, that Dr. Frankland had himself stated that the chalk well at Croydon, from which the public supply is obtained, is actually polluted with the soakage of foul matters from the irrigated grounds at Beddington. The morbific effects of such water are but too frequently observed, as the annual reports of the medical officer of the Privy Council abundantly testify; and then, again, if the doctrines of Professor Von Pettenkofer, of Munich, be correct, as they certainly seem to be, that fluctuation in the level of ground water charged with sewage is the most active agent of fever and cholera, the consequences of irrigation may be most serious.

4. And now there is another very important objection to the system—the danger of propagating parasitic diseases. Sewage contains myriads of ova of intestinal entozoa—every segment of a tape-worm discharged from the human body is crowded with them; and if distributed with sewage upon the land will become attached to the grass and other green fodder which is produced thereon. This is eaten by cattle, whose bodies quickly become infected with the parasite in its larval condition, and thus the measly meat becomes the agent of disease in our own bodies. At present, the distribution of these ova, and their access to the bodies of herbivorous animals, is entirely a matter of accident; but make it a matter of certainty, as most assuredly you will by distributing sewage upon the fodder-producing land, and the consequences must be serious. Dr. Cobbold, who is our highest authority on this subject, has published an essay to warn the public against the danger of this method of disposing of town sewage; and he has hinted at the probable introduction into this country of a terrible helminthic malady (*Bilharzia*), which is now common in Egypt, in Africa, and the Mauritius, and which would assuredly be propagated throughout the land by this dangerous scheme of irrigation. "Have the kindness," he says, "to observe that every colonist returning from the Cape is liable to bring this parasitic treasure with him as a 'guest' indeed, dwelling in his blood, and feeding on his life stream. In the advanced stages of the malady, the afflicted individual must frequently evacuate the eggs and their contained embryonic larvæ, which are thus conveyed into the ordinary receptacles of such voidings. There let them remain, or convey them into a cesspool, and no harm follows. If deemed preferable, you may transport them, along with myriads of other human parasite eggs and larvæ, into a common sewer, and thence into the sea; still, entozoologically speaking, no harm follows. Here, however, let me invite you to pause; for if, without due consideration, you adopt any one of the gigantic schemes now in vogue, you will scatter these eggs far and wide; you will spread them over thousands of acres of ground; you will place the larvæ in those conditions which are known to be eminently favourable for the development of their next stage of growth; you will bring the latter in contact with land and water snails, into whose bodies they will speedily penetrate; and, in short, you will place them in situations where their yet higher gradations of non-sexual growth and propagation will be arrived at. After all these changes, there is every reason to believe that they will experience no greater difficulty in gaining access to our bodies here in England than obtains in the case of those same parasites attacking our fellow-creatures, whose residence is found in Egypt, in Natal, in the Mauritius, or at the Cape. In a natural history point of view, it would not be an altogether singular result if, 20 years hence, this parasitic malady should be as prevalent in this country as it is now known to be in particular sections of the African continent. Foreseeing the possibility, not to say probability, of this contingency, am I not right," he says, "after years of long study, to raise my voice in the hope of preventing such a disaster?"

Nor is it unlikely that the Trichina may be distributed in the same manner, for it swarms in the intestines of those who have just become infected with it, and may be discharged into sewage, and scattered upon the land, and eaten by creatures, whose flesh will give it back to us again. No one, indeed, but the helminthologist can say what particular parasite may not be distributed and propagated by this dangerous agricultural process. "May we not indeed," as Dr. Cobbold observes, "but too reasonably conjecture that the wholesale distribution of tape-worm eggs by the utilization of sewage on a stupendous scale, will tend to spread abroad a class of diseases, some of which are severely formidable? So convinced am I," he says, "of the truth embodied in an affirmative reply to this latter query—so certain am I that parasites are propagated in this particular way—so surely do I foresee unpleasant results, if no steps be taken to counteract the evil, that I feel myself bound to speak out boldly, and to produce no uncertain sound in the matter which most closely concerns humanity." The whole question, in fact, is of vast hygienic importance.

But, fifthly, let us see if the process, in a sanitary point of view, is so successful as to render the sewage innocuous, before its admission into a running stream. Go to a sewage farm after you have given due notice of your intended visit, and you will be taken to places where the subsoil water is running from the land apparently pure and drinkable; and no doubt with proper management, under proper conditions of thorough and effective filtration, such a result may be achieved; but the real question is how far this is really and practically accomplished, for it involves such a nice adjustment of all the appliances, such a continuous distribution of the sewage over successive areas of land, and such constant supervision, that it is rarely effected. To judge of the results, therefore, you must visit these places, as I have done, without previous notice, and you must examine the whole district, for it is not uncommon to find byways for the disposal of the sewage which the land will not take. Not long ago, as I have said, I visited Aldershot, with Mr. Hawksley, Mr. Eggar, and Professor Ansted. This you know is a pet place with the advocates of the system, but at the time of our visit we found that nearly all the sewage was passing along the carriers to the outfalls, and going bodily into the river. I took samples of the sewage as it entered the farm from the two camps, and as it flowed from the farm to the river. The original sewage contained 54 grs. of soluble matter per gallon, and 44 grs. of insoluble, each of which contained about 30 grs. of organic matter. As it left the filter-tank it contained the same amount of soluble matter, and 35 grs. of suspended, of which about 26 grs. were organic. As it ran along the carriers to the lower part of the farm, it retained its black offensive character, and this was very marked upon that portion of the land where a little of it was distributed. At one of the outfalls into the Blackwater River it contained 52 grs. of soluble matter per gallon, of which 28 grs. were organic; and 3·84 grs. of suspended matter. At three other outfalls from the farm the soluble matters amounted respectively to 52 grs., 58 grs., and 54 grs. per gallon, of which 24 grs., 20 grs., and 22 grs. were organic; the suspended matters being 26 grs., 6 grains, and 5 grs. per gallon respectively, of which 12 grs., 2 grs., and 3 grs. were organic. At the several points of discharge into the river the sewage was black and fœtid, and there were large accumulations of sewage mud in a high state of decomposition. I took a sample of the river water before it received the outfall sewage, and after; the former contained 19 grs. of soluble matter per gallon, and the latter

24 grs., of which the organic amounted to 3½ grs. and 5 grs., the ammonia in the two cases being 0·264 of a grain, and 1·545 gr., showing an enormous pollution of the river by the so-called defœcated sewage. Everywhere upon the land where the sewage had been distributed there were masses of fœcal matter, waiting for the first heavy shower of rain to wash them away into the nearest outfall, and the neighbouring ditches were in a most offensive condition, and we were told by the occupants of the houses adjoining the farm that in times of flood the whole roadway was covered with sewage matters. Considering the praise which has been bestowed on the alleged success of this farm, I was not prepared to witness such a frightful condition of things.

At the Craigintinny meadows, near Edinburgh, it is notorious that the outfall water from the farm is shockingly offensive, but as it runs into the sea it is not complained of as a nuisance. A like condition of things, but not to such an extent, I have seen at Norwood, at Rugby, at Warwick, and at Banbury—in fact, at the last-named place the ditches around the farm were full of sewage, and the water was running from the outfall in a very offensive state, showing that the process, although susceptible of good results, is rarely so in practice, unless it receives an amount of attention that makes it a serious business. Besides which there are times when no attention will prevent the discharge of foul sewage from the land, as when the soil is heavy, and a flood of rain sweeps over it, and when vegetation is dormant. In winter time it will freeze upon the land and kill the grass, and, as it thaws, run off to the nearest stream. At Warwick we saw acres of ground thus despoiled, where the defœcation of sewage was entirely a matter of surface filtration. All authorities, indeed, agree that the success of this process is dependent upon a combination of circumstances which are not always attainable, and upon the strictest care and supervision. Even then, according to Dr. Frankland, although it may purify sewage to a great extent, it does not sufficiently purify it to render it admissible into potable water without danger; "the risk arising not only from the considerable amount of animal organic matters which the effluent water still retains in solution, but also from the absence of any guarantee for the removal of the germs or other noxious suspended matters which are frequently present in sewage."

The other means of dealing with sewage, so as to separate the suspended matters, and to remove a certain portion of those which are dissolved, is to submit it to chemical treatment. Already there are are sufficient facts to enable us to review this part of the subject.

At Leicester, at Hertford, and formerly at Tottenham, the sewage was defœcated with lime, the lime being used to the extent of from 5 to 20 grs. per gallon of sewage. The treatment is effected by adding the lime to the sewage, and then briskly agitating it; after which it flows into subsiding-tanks, where the sedimentary matters deposit, and the clear supernatant water runs off by a weir placed a little below the surface. At Hertford the supernatant water is filtered before it is discharged into the outfall, and in summer time a little chloride of lime, amounting to about half a grain per gallon of sewage, is also employed, as it is found to deodorize the sewage, to check secondary putrefaction, and to prevent the growth of the sewer fungus in the outfall channel. In the year 1858, when I first examined this process at Leicester and Tottenham, for Messrs. Bidder, Hawksley, and Bazalgette, the referees appointed by the Metropolitan Board of Works to consider the question of the main drainage of the metropolis, I found that with 12 grs. of lime per gallon of sewage the whole, or nearly the whole, of the suspended matters were removed, and that the soluble organic matter fell from 18½ grs. per gallon to 10½ grs. When 20 grs. of lime were used, the soluble organic matter fell to about 9 grs. On the occasion of a more recent visit to Leicester, with Dr. Frankland and Dr. Odling, at the instance of the Thames Conservancy Board, we found that the soluble matters of the sewage were reduced from 63 grs. per gallon to 48 grs.—the organic matter falling from 15 grs. to 5 grs. At Hertford, where the original sewage is remarkably weak on account of subsoil water, I have ascertained from many experiments that the organic matter in solution is reduced from about 3 grs. per gallon to 1·6 gr. All these results accord well with laboratory experiments, and they show, as I stated in my original report to the referees alluded to, that, "judging from the experiments which I have made, and the observations of practice on a large scale, it is ascertained that about 12 grs. of lime to a gallon of sewage will effect the speedy separation of all the suspended matters, and also about one-fourth of the dissolved organic matter, leaving a clear liquor which has lost a great part of its offensive odour: and when the clear liquor is mixed with from five to seven times its bulk of water, and is exposed to the air, it is no longer offensive."

"At Leicester, where the lime process has been adopted, the river Soar, into which the sewage flows, has undergone a remarkable improvement. Before the works were established the river was most offensive, the fish were killed, the vegetation of the river was destroyed, and those who inhaled the effluvia from it were constantly ill. At the Belgrave Mill, which is just below the point where the sewage enters the river, the foulness of the stream was such that in summer time the water of the mill-dam appeared to boil with putrefaction; the stench from it was intolerable, and so large was the quantity of sulphuretted hydrogen evolved, that the silver in the men's pockets turned black in a few hours. At that time the men were constantly affected with diarrhœa, they lost their strength, and their appetites always failed them; one man only out of thirty men in eighteen years had been able to stand it, and he it was who gave me an account of the matter. Now, however, and for the last three years since the lime process has been adopted, the river presents an entirely different appearance—aquatic plants have begun to flourish, the fish have ventured to return, the black mud has ceased to accumulate, and the mill-dam is no longer offensive. All along the stream the people speak of the change with satisfaction, and it would appear that the process fulfils the requirement of the local Act, which demands that the water discharged from the works shall not occasion a nuisance, or be injurious to the health of those who live or are employed on the banks of the stream."

Crude sulphate of alumina is another precipitating agent. It is practised at Stroud, in Gloucestershire, and is known as Bird's process. The crude sulphate is made by adding about 20 lbs. of sulphuric acid to a hundredweight of powdered clay, and allowing it to stand for some time. This material is mixed with sewage in the proportion of one hundredweight to from 20,000 to 30,000 gallons of sewage, and the sedimentary matters are collected in a properly constructed tank. Sulphate of alumina is decomposed by the ammonia of the sewage, and the alumina flocculates and precipitates the suspended matters, leaving a clear supernatant liquid, from which a good deal of dissolved organic matter has been removed.

To ensure the precipitation of the alumina, Dr. Anderson, of Coventry recommends the addition of lime. Crude sulphate is made by adding one part of sulphuric acid to two of clay, and then two parts of water. After standing for some time in a warm place the combination of the acid with the alumina is effected, and he uses about one pound of this material to every 100 gallons of sewage. The mixture is well agitated, and then a quarter of a pound of lime in a creamy condition is added. Again it is agitated, and the flocculent alumina, together with the suspended matters, rapidly falls. The sediment is collected in subsiding-tanks, which are worked alternately, and the clear liquor is run off from it. As in the last case the suspended matters are entirely removed, with a considerable amount of the dissolved organic matter.

Chloride of iron, with lime, is also a powerful defœcator. It was formerly used at Northampton, and is still to some extent with lime—the lime being first added to the sewage in the proportion of about a bushel to 8500 gallons of sewage, and the chloride of lime to the extent of about half a gallon! The chloride is made at the works, and contains about 9500 grs. of the mixed chlorides of iron per gallon. In this case also the precipitation of the sewage is very complete. At present, however, the local authorities are using sulphate of iron and alumina instead of the chloride. The compound is made by mixing 3 cwts. of crude sulphuric acid with 2 tons of a ferruginous earth obtained in the neighbourhood. After standing for a few days the mixture is ready for use, and it is added to the sewage in the above proportion to a million gallons of sewage.

At Leamington, where there is an injunction against the discharge of unpurified sewage into the river Leam, the authorities have resorted to the use of the "A. B. C." process of Mr. Sillar, which is worked by the Native Guano Company at its own cost. The sewage flows to the works by gravitation, and there it is mixed with the A. B. C. material (consisting of alum, clay, sulphate of magnesia, bone ashes, wood charcoal, and a little blood diffused through water) The material is added to the sewage in the proportion of 1 gallon to 200 gallons of sewage, and the whole of it well agitated. It then flows through subsiding-tanks, where the precipitated matters subside, and the clear water flows off from a weir into an outfall channel with a filter. The tanks are worked continuously for about a week, when the precipitated matter is removed to a centrifugal machine, and drained to the consistence of putty. This is further dried by exposure to the air, and its ammonia is fixed by means of a little sulphuric acid, which also breaks up the organic matter. In this state it is riddled, and sold freely at a good profit for manure.

Samples of the Leamington sewage were taken for examination by the Royal Pollution Commissioners on the 11th of December last, and duplicates of them were furnished to me on the following day for analysis. I ascertained that the original sewage contained 66 grs. of solid matter in solution per gallon, of which 14·43 grs. were organic, while the effluent water before filtration contained 67 grs. of soluble matter per gallon, of which 11·27 grs. were organic, and the filtered water contained 61 grs. per gallon, of which 7·58 grs. were organic. Again, the suspended matters in the original sewage amounted to 113·6 grs. per gallon, while in the effluent sewage before filtration it was 7·64 grs., and in the filtered sewage, 3·12 grs. The Royal Commissioners, in describing their results, do not mention the filtered water, but in other respects their results accord pretty closely with mine.

Lastly, there is a process of the late Mr. Blyth, which is very deserving of attention. Mr. Blyth was the chemist of the old Board of Health, and he had great opportunities of studying this matter. His plan is first to add a soluble phosphate of lime and sulphate of magnesia to the sewage. After agitation, the mixture is neutralized by means of a little slaked lime, and the precipitated magnesian phosphate carries down with it the whole of the sedimentary matter, and a portion of the soluble ammonia. A million tons of sewage require about 1 ton 8 cwts. of Blyth's compound, and 4 cwts. of lime to neutralize, and the resulting dry precipitate weighs about 3 tons 8 cwts., and contains about 58 per cent. of organic matter (yielding 4·5 ammonia), and 8·66 of phosphate of lime.

All these processes are manifestly capable of separating from sewage all the sedimentary matter, and also of removing considerable portions of dissolved organic matter; but to be effective there should not only be good agitation of the sewage after the addition of the precipitating agent, but there should also be sufficient tank-room for the deposition of the sewage for not less than four hours; and there should also be a means of filtering the defœcated sewage before it is discharged into the river or other watercourse.

After witnessing the action of lime as a defœcator, at Leicester and Hertford, Dr. Odling, Dr. Frankland, and myself reported to the Thames Conservancy that the following were the conditions necessary to its success:—

1. The proportion of lime should not be less than one ton to a million gallons of sewage, and that there should also be used 56 lbs. of chloride of lime.

2. That the mixture of the sewage with the lime and chloride of lime should be very complete, and that the mixture should be agitated, so as to aggregate the suspended matters, and thus assist in the subsequent precipitation of suspended matter.

3. That the sewage when thus treated with lime should flow along two subsiding-tanks in series; the first should be capable of holding at least one hour's flow, and the second of holding not less than four hours flow. The tanks should be 4 feet in depth, and the overflow of the defœcated sewage should be by a weir only half an inch below the surface.

4. That there should be a double set of tanks for alternate working.

5. That the defœcated water should flow through a shallow open conduit of not less than a quarter of a mile in length before being received into a stream of freely running water, of not less than eight or ten times the volume of the defœcated sewage.

In this way, or by any similar process of defœcation, the sewage of towns may be easily and safely dealt with, so as, on the one hand, to ensure its purification before it is discharged into a running stream, and, on the other, to avoid the many dangers of irrigation.

I refrain from entering on the subject of the pecuniary aspects of this question, for they are nowhere encouraging, notwithstanding that the most sanguine opinions have been expressed of the commercial and agricultural value of sewage. Irrigation, like precipitation, except in the case of the Leamington process, is everywhere unprofitable, when it is conducted in such a manner as to prevent the pollution of the neighbouring streams; and I warn you against the glowing accounts which are given of the profitable returns of certain sewage farms, for, if the cost of outlay is considered and balanced with the average returns, it will always be found to be a losing affair. The most sanguine enthusiasts of the system have generally abandoned it after a trial of its merits. Little or nothing, in fact, can be profitably grown upon the sodden land but Italian rye-grass, and when this is abundant and must be cut, or it will rot upon the ground, it must be sold for what it will fetch. In the summer of 1866, when I was in Edinburgh, I saw acres upon acres of rye-grass rotting upon the far-famed Craigintinny meadows; and when I asked the cause of it I was told by the manager that the cattle plague had ruined his customers, and there was nobody to buy it and nothing to eat it, and there it must rot. Besides which there are considerable doubts as to the value of it as fodder. Mr. Campbell, of Rugby, who ought to be a high authority on the subject, for it was a pet of his, honestly declares that his experience does not show a profit in the use of such fodder, and he gives a good example of it. Twelve Ayrshire cows, which calved about the same time, in May, 1869, yielded, at the end of twelve weeks, an average quantity of 9½ quarts of milk per day per cow. Their daily consumption of rye-grass was 1½ cwt. per cow. If they had been milked for nine months the average daily yield of milk would have been only from 5 to 6 quarts per cow. The cost of the grass, at 10s. a ton, was 9d. per cow per day, and the other expenses of the dairy raised it to 1s. 3½d. per cow. The milk, at 8d. per gallon, was worth only 1s. 7d.; and when the cost of sending it to market was taken into account, together with the wear and tear of utensils, he vainly asked for profit.

But all this is, as I have said, no part of my present inquiry, for my business is solely with the sanitary part of the question; and I would ask you whether, having regard for the public health, there are not serious dangers in the rash recommendations of the Royal Pollution Commissioners to scatter the sewage of every city and town in the kingdom broadcast upon the land? Medical authorities of some sanitary experience are alone able to engage in such important pathological considerations, and it must strike every one who is interested in the subject that a Royal Commission without any pretence of medical knowledge is singularly incompetent to deal with such a matter. What importance the public or Parliament may attach to their recommendations I am unable to learn, except from former experience, but it is clearly our duty as

public health officers to examine the subject from a medical point of view, and I doubt not what will be the conclusion.

Dr. COBBOLD said that individually he regarded the sewage question as one which was three parts out of four a chemical question. On this account he thought the chemists should have the advantage of speaking first upon it. Dr. Letheby had referred specially to the remarks made by him in his *brochure*. Now, though the observations he made there were written in a warm—perhaps too warm a strain, he believed there was no statement which he was not still prepared to substantiate. And he thought since he had gained more experience in experimental researches, that he could now write a pamphlet much more cogent than that to which Dr. Letheby had alluded. With reference to parasitic diseases, he would only say that he knew of two patients in this country who were suffering from that frightful malady which was so destructive in Egypt. These patients at every urinary discharge must pass a number of the eggs of this parasite, and if the number of persons so afflicted was increased fivefold, the chances of the extension of this disease must likewise increase. But happily there were so many contingencies which the parasites had to encounter before they arrived at the human body that the community were yet spared; still he held by the statements contained in his pamphlet. Then take the case of ordinary tape-worm disorders, respecting which he had had much experience. There were about 3000 persons in London suffering from this cause, who each passed from 4 to 12 joints a day, each joint containing 30,000 mature eggs, which would give at least a daily return of 450 millions, but he believed 1000 million eggs was nearer the mark. A certain number of grains of organic matter per gallon were found by chemists in sewage, of which organic matter these eggs must be part and parcel. A handful of large entozoa parasites had been taken from the Craigintinny meadows. If this sewage was distributed far and wide, it was certain that a considerable portion of these millions of eggs must gain access to the herbivora. It was known, from experimental researches, that measles were developed productively in beef. It was a popular notion that pork only developed measles, but he would assert that in underdone beef persons ran a greater risk. The proportion of tape-worm disease derived from measly beef was as 7 or 8 to 1 in the case of pork. It was, therefore, to incur an enormous risk to distribute sewage which contained these germs over the land. It was possible to decimate the population of any town within a certain number of months by the distribution of tape-worm germs, there being one tape-worm in particular which produced a disease of the human body at present causing the death of 400 persons annually in this country. If that parasitic disease should increase in the same proportion as other parasitic diseases, such as the ordinary tape-worm, a result would follow such as still obtained in Iceland, where one-sixth of the population died annually from this cause. Having these facts to deal with, and knowing the developmental process through which these parasites passed, he thought they were called upon to ask people to pause before adopting a scheme so gigantic as that now proposed, fraught as it was with consequences so serious as those which he believed were involved in it.

Mr. HOLLAND said he did not believe any portion of Dr. Letheby's paper, and he thought the writer was inconsistent with himself. In the first place he alleged that twenty times its volume of water would purify the sewage poured into it, and afterwards he asserted that even a small quantity of water from irrigation meadows was poison. Was Dr. Letheby prepared to recommend that the soil should be burnt; if not, what did he propose to do with it? Unless he was prepared to recommend that all human manure should be burnt to avoid the supposed risk, his argument went for nothing. He (Mr. Holland) believed that the danger of spreading disease by the irrigation system was purely imaginary. Where was the evidence of disease having been produced where the system was adopted? He had made inquiries on the subject and could find none. At Carlisle he asked whether the sheep had the rot, and was answered that they had not. At Edinburgh cows had been fed with grass from the irrigated meadows for 60 or 70 years, but there was no evidence of the prevalence of disease among them. It was true that they were not very healthy, but this arose from their mode of life. Everything was done to stimulate the production of milk from them, and they suffered from want of exercise and fresh air. Sewage was nothing but manure suspended in water, and the error was not in putting it on the land at all, but in putting it on in excess. At Carlisle he had been told that the residents in the neighbourhood of the irrigated fields were unhealthy, but on inquiry it turned out that there were no inhabitants in close proximity, and of those who were anywhere near there were abundant causes of unhealthiness in the condition of their houses.

Dr. CARPENTER considered that the arguments of Dr. Letheby were based upon a false foundation, and that either he had little practical acquaintance with the facts from which he had drawn his inferences, or had taken only such portions of them as were calculated to sustain his view of the case. Dr. Letheby had alluded to some statements made by him, and had specially referred to the sanitary state of the fields at Beddington. The people of Croydon were some of the earliest to adopt any sanitary arrangements at all. They were compelled to adopt some plan, because of the terrors of the law—no less than five or six injunctions having been obtained against them, and the local board were threatened with committal to prison unless they ceased to do certain acts. That was in 1858, and in 1859 and 1860 they obtained powers to do what they had since continued to do. In 1860 the irrigation meadows were laid down, and they had been in active operation to the present time. Until this year no complaint, either officially or otherwise, had been made of injury arising from these meadows. Previous to 1860 the town had been put to thousands of pounds expense for damage occasioned by the sewage, but from that year till within the last nine months they had been free from such liability. In 1860 they laid down 276 acres of land for the purpose of irrigation, and to remove the mischief which 19,000 people produced by their sewage. Since then the population of the town had increased to 50,000, and he was free to confess that the quantity of sewage was too much for the land. The result had been that occasionally of late the water was not so effectually purified as it should have been. Until 1867 no cases of fever occurred there. The water of the effluent stream passed through the grounds of a gentleman residing in the neighbourhood, and even at the present time trout might be seen swimming about in it. That being the case, was it not evident the plan adopted for dealing with the sewage was the correct plan? Indeed, Dr. Letheby said so himself, and it had been shown in that room that, if sewage were made to pass through 5 feet of earth, it would be rendered perfectly innocuous, and would be perfectly oxidized. Surely, then, the passage of sewage over land where it was exposed to the air and came in contact with growing vegetable matter, would remove from it all those elements which were injurious to health, and the water would go off perfectly pure. Dr. Letheby was in the position of an engineer who, some years ago, wrote a pamphlet to prove that it was totally impossible for a steamboat to cross the Atlantic, because she could not carry sufficient coals, and whose pamphlet was issued at the very moment that a steamer was actually accomplishing the feat. The town of Croydon was a standing proof that sewage could be successfully disposed of in the way Dr. Letheby asserted to be impossible. With regard to the question of health, he might state that, since the beginning of the year, there had not been a single case of fever reported to the Board of Guardians from Beddington, and he might add, as the medical attendant of most of the wealthy families there, that he had not had a single case of fever, either typhus or typhoid, among them since the irrigation meadows commenced. With reference to the effect upon the inhabitants of Croydon proper, surely, if the emanations from the farms were so dangerous as represented, the inhabitants of the densely populated low-lying parts, which were within 500 yards of the outfall of those farms, would have suffered from typhoid. But for a long period there had not been a single case in that low district, and with the exception of a few cases of scarlet fever there had been no fever there at all. The irrigation process went on during the winter as well as the summer, and in the former period of the year the water had gone off pretty nearly free from those elements which were injurious. This was the result of experience of the system forced upon the parish of Croydon, and which they had not taken up of their own will. Having observed the process, and seen its effects, he was positively convinced that the air which passed over the fields, instead of being injurious, was a benefit to the people living around. It was a positive fact, with regard to Norwood, that the moment the irrigation fields were established the mortality fell from 18 to 15, and had remained so. Dr. Letheby said he had evidence of water coming off the fields in an impure state. He (Dr. Carpenter) knew that there had been such instances, arising from the fact that persons had gone to the fields, broken down the carriers, and pulled at the sluices, letting the water out. Dr. Letheby knew very well that the argument to be drawn from the chemical analysis of the water was valueless, unless he was aware of all the circumstances of the case.

Professor ANSTED, being referred to by the chairman, as having had experience in these matters in connexion with the city of Milan, said he hardly felt qualified to take part in the discussion, although, perhaps, so far as a certain amount of familiarity with works of this kind went, he might be able to afford some little information. The general subject appeared to him as far more belonging to the medical man than the geological engineer, if he might so denominate himself. Having had the opportunity, now and then, of noticing the results obtained during the irrigation of considerable tracts of land on a large scale, with material more or less mixed up with sewage, he thought he was justified in saying that in most cases, if not in all, those results had been certainly unfavourable to the general health of the neighbourhood. The chairman alluded to his experience at Milan. He knew the town well, and the way in which the sewage was conducted over the fields in the lower part of the town, and he believed, on the evidence of medical men—some of whom had been examined by parliamentary committees in this country, and whose evidence might be found in Blue-Books—that the result of the system pursued there was eminently unsatisfactory with regard to the health of the people living near where the works were carried on; and it was not astonishing, for no one could go into the lower parts of the town near the stream and the works without being conscious of their being eminently disagreeable, and probably unhealthy. The Italians were not particular on the subject of smells, but it was confessed that these were very objectionable. The sewage was carried over the fields, and took its course. Sometimes it was used, and in all probability, when that was the case, it passed off the ground without doing any damage to the water of the stream; but during a great part of the year such was not the fact, and the consequence was that the stream in its course was much polluted. And this was a result which he had also observed in other parts of the world. A few days previous he had the opportunity of visiting the irrigation works at Aldershot, and there it was perfectly clear to him that the farm which took the camp sewage and was working it was utterly inadequate for the quantity put upon it, and that, from the nature of the irrigation, the sewage water carried over the fields could only be used upon a very small scale, while the greater part of it necessarily ran away into the river. He could not help thinking that in most cases this must be the result. It was not for him to say what was the right method of getting over the extraordinary difficulty which the public were called upon to face, but that some method must be adopted was evident. The question before the meeting was whether the particular method of carrying on the work suggested by the Royal Commission on the Pollution of Rivers was likely to be practically useful. As far as his own experience and knowledge were concerned, it seemed to him that the method of carrying away the sewage and utilizing it by irrigation might be successful upon a small scale, where the population was limited and the acreage was large; but he could not see much probability of its being successful upon a large scale, for what upon a small scale would practically do no harm—say in the case of 200 or 300 acres—would be attended with very serious results in the case of a large city or town. It might be very well in the case of Croydon, where the population was small, but the limits of the adaptability of the system were soon reached, and could not be advantageously extended.

Mr. LIDDLE remarked that in dealing with the subject they had two enthusiasts to encounter—Dr. Letheby and Dr. Frankland—whose papers were always read with attention, and probably between the two some useful information might be gathered. He was disappointed in the paper just read, because it contained very little which was of practical benefit to the meeting as a body of sanitary officers. It raised objections to the existing modes of operation, but it gave them no hint as to what could be done with the sewage, how to utilize it without creating a nuisance, and exposing the community to those fatal consequences which Dr. Cobbold had described.

Mr. CREASY thought it was necessary to explain in some degree the sort of conflict of evidence which had taken place. When Beddington was mentioned, it should be known that it was a large district, and that a portion of it had little to do with the sewage question. The sewage fields of Croydon had been well chosen with reference to population, but certainly in every cottage on the estate there had been typhoid fever through the whole course of the time—not a cottage had escaped. And as to the outfall at Beddington Corner, every well was contaminated, and not a house was free from fever. At Carshalton he had had cases of enteric attack. At Beddington Corner, near the outfall, four children had been taken out of one house in a day striken down with scarlet fever.

Dr. CARPENTER interposed the remark that the local nuisances in connexion with those cottages were quite sufficient to produce all the fever complained of, without seeking a cause in the outfall sewer a quarter of a mile off.

Mr. CREASY said that might be, but the watershed went in that direction. In every one of those houses an examination of the tongues of the inhabitants would show that there was enteric irritation. The same indications which were caused by the Croydon sewage on one spot arose from the existence of cesspools on another.

Mr. HAWKSLEY said he could fully justify the statements made by Mr. Creasy, for few persons were better acquainted than himself with the results of the irrigation works at Beddington Corner. He had been professionally called down to look at those works at intervals for many years, and also in consequence of complaints having arisen, although Dr. Carpenter stated there had been no such complaints since 1860. When on other occasions he had been in the neighbourhood on totally different business he had taken samples of the water as it fell into the Wandle, and had them analyzed. He had also been up the stream, and looked at the confluence of the two waters, which ran over the meadows in different directions. On one recent occasion he found one of those waters exceedingly clear, and the other about as foul as it could be. These two waters met, and passed down by the side of the cottages just mentioned, and thence to the Wandle. In the month of February last he was down there; the sewage was then frozen over the whole surface of the land for acres and acres, and was not in the state which Dr. Carpenter had described. But, besides that, he had been there in the summer, and in the summer it depended very much upon the state of the water as to whether the sewage, when passed upon the land, stank or not. In warm weather it often stank frightfully, especially on "muggy" evenings. The sewage then gave off a very sickening, though not necessarily a very powerful odour. The same sort of thing occurred everywhere when sewage was applied to land—at the Barking farm, at Edinburgh, at Aldershot, and every place he had visited. It had been stated, to his great surprise, in the course of this discussion, that at Carlisle the sewage did not stink. Most

assuredly it did in hot weather, although the entire quantity of sewage put upon the enormous acreage of land there was only from 200,000 gallons a day as a minimum, to something under 400,000 gallons as a maximum, which was only one-sixth of the sewage of Carlisle. And it was there of so little value that the other five-sixths were allowed to run away into the river, though the acreage of land for its reception was sufficient to utilize the whole. As to the commercial economy of the system, he had made a great many inquiries, and he had been told very frequently of crops being sold at £18, £20, and even £25 an acre, and that every one was delighted with the effects. But when he came to ask what was the net result of the year's working, he was answered, "Ah, that is another thing." "Well, but what is it?" "Well, we lost so many hundred pounds last year"—and in some cases so many thousands. There was not one single place he had heard of where the application of sewage for the purpose of sanitary disinfection was proved to be a commercial success. It was a commercial success at Edinburgh. Why? Because it was not applied for sanitary purposes. They used as much as they required for irrigation purposes, and the remainder ran into the sea or river nearly as foul as when it entered upon the land. But this was not the question now before the meeting. The question before them was one which almost every one could answer for himself. Take the case of plain irrigation by water only—pure water—water issuing, as in the majority of irrigation schemes in this country, from chalk springs. They all knew that when water was put upon land in certain seasons of the year in that state it did fertilize the land, and good grass crops ensued. But what was the result in a sanitary point of view? Fever and ague were produced. Go to Italy. He had been over all the irrigation works there, extending for 200 miles in one way, by 60 or 70 in the other, and what was the result? The people were in a state of actual decrepitude, not simply affected with fever, but with rheumatic complaints, and there was a great deal of cretinism. The same thing existed in the South of France, where irrigation by water only was adopted. Superadd to this foul organic matter, and what must be the result. He believed there was really nothing to be learned upon the subject. His own opinion was that of all unsanitary applications the most unsanitary was that of the application of sewage to land by way of irrigation.

Mr. CREASY said the Beddington grass was irrigated as long as it could stand up, and then it was sent away to market with the sewage some inches up the stem. So that if Dr. Cobbold was right there was an opportunity for the development of entozoa there.

Dr. LETHEBY, in bringing the discussion to a close, said he thought Mr. Holland had not quite apprehended the statements he had made. He had said all along that sewage going into a running stream where there was abundance of of vegetation, fish, and a large quantity of oxygenated water, even in the condition of sedimentary sewage was by a natural process quickly disposed of. But what he also said was that the main cause of all those nuisances, which arose from the discharge of sewage into running streams was the sedimentary matter it contained, and that the distribution of sewage upon the land at the present time did not provide a remedy, and was accompanied by a large number of disadvantages. He said, further, that there was another means whereby these sedimentary matters could be separated—that by a process of chemical precipitation, as by lime, sulphate of alumina, or the agents employed by the A. B. C. Company, or that recommended by Mr. Blyth, they had the power to do certainly, and without danger, what they were not doing certainly when the sewage was put on the land, and with a great deal of danger. By this system of precipitation they could separate those solid elements, and could superadd agents which were not particularly injurious to the highest forms of animal life, but were deadly to those creatures referred to. There was indeed a mode within their reach of dealing with those sedimentary matters which were the real cause of nuisance by accumulating in the rivers, and of rendering the water in such a condition that it might safely be admitted into a stream of eight or ten times its volume. It was a fact that in every one of the places visited, where the irrigation system was adopted, they found—whether by accident or design—abundant evidence of those evil results which it was most desirable they should seek to avoid. The system of precipitation, by chemical processes, could, however, be carried on without the slightest danger to the public, but this could not be said of any system of irrigation; for it was indisputable, from the investigations of Dr. Murchison, that sewer gases would produce sewer fever; and as these gases are abundantly evolved from irrigated land, no doubt it was a question open to a great deal of discussion as to how far they must be diluted before they would cease to produce dangerous consequences. He had told them what he found in his own experience at a model place—the Hebble Brook—where the inhabitants were so decimated by fever that the system was obliged to be stopped. He was asked whether the sewage then was to be wholly lost, and not utilized upon the land? He hoped he had sufficiently answered those questions by showing that the proposed mode of dealing with it was open to the objections that it was dangerous and uncertain, and that there were other and better means of dealing with it. He did not mean to say that by irrigation sewage could not be defœcated, but he contended that the system required great attention, and that the result could not be realized in practice; whereas, by the adoption of chemical processes, there was a safe and certain mode of accomplishing the object, and so far as he knew, these processes were more economical, for there was not a single instance in the country in which the utilization of sewage by irrigation had proved profitable.

On the motion of Mr. LIDDLE, a vote of thanks was given to Dr. Letheby for his paper, and the proceedings terminated.

AVERAGE COMPOSITION AND QUALITY OF THE METROPOLITAN WATERS, MAY, 1870.—The following are the returns of the Metropolitan Association of Medical Officers of Health:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Comps.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	18·73	0·054	0·075	0·001	14·6	3·8
West Middlesex	17·37	0·033	0·109	0·000	13·7	3·8
Southwark and Vauxhall	17·13	0·054	0·080	0·002	13·5	3·6
Chelsea	18·57	0·050	0·066	0·001	14·2	3·8
Lambeth	18·27	0·063	0·075	0·003	13·9	3·1
Other Companies.						
Kent	28·00	0·011	0·129	0·000	20·0	5·9
New River	16·09	0·011	0·111	0·000	13·1	3·1
East London	16·11	0·020	0·091	0·002	13·2	3·2

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c.' is determined by a standard solution of permanganate of potash acting for three hours; and, in the case of the metropolitan waters, the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, in that of the Lambeth Company. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Association of Medical Officers of Health, 101,498,883 gallons; and the number of houses supplied was 477,996. This is at the rate of 31·6 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 25·7 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne. HY. LETHEBY, M.B.

SALE OF NEW RIVER SHARES.—The shares of the late Miss Horton in the New River Company, having a large and yearly increasing income, and conferring votes for the counties of Middlesex and Hertford, consisting of 4-5ths of one King's share, and 5-12ths of one Adventurers share, 17 new shares of £100 each, fully paid up, and 68 new shares, with £20 each paid thereon, chiefly acquired between the years 1823 and 1831, were recently sold by auction, at the Mart, Tokenhouse Yard, Bank of England, by order of the executors of the deceased lady. The net income derivable from these shares for the year 1869 was £2105, and in 1866, in addition to the income for that year, a bonus was paid in respect of these shares of £1726 13s. 4d. The following prices were realized:—Lots 1 to 17 inclusive.—Seventeen £100 new shares (fully paid up) in the New River Company, the dividends upon which for the year 1869 being at the rate of £7 5s. per share, with the certainty of a yearly increasing income—£3329, or an average of £195 per share. Lots 18 to 24 inclusive.—Sixty-eight £100 shares in the New River Company, £20 per share paid up, the dividends on which for the year 1869 being at the rate of £1 9s. per share, a large increase on which may be fairly anticipated—£3490 (or £50 per share for the first 50, and £55 per share for the remainder). King's Shares: Lots 25 to 30 inclusive.—1-20th part of an undivided 36th share, or "King's moiety," in the estates and interest of the New River. The dividends, of which this and the five succeeding lots form parts, for the year 1869, amounted to £1516 13s. 4d., or £75 16s. 8d. for each twentieth thereof; and in future a considerable increase on each succeeding dividend may be expected—£11,720 (being £1950 each for the first four lots, and £1960 each for the last two). Lots 31 to 38 inclusive.—Valuable freehold property, consisting of 1-16th part of an undivided 36th share, or "King's moiety," in the estates and interest of the New River. These lots confer votes for the counties of Middlesex and Hertford. The dividends on the King's share for 1869 amounted to £1565 10s. 6d.—£20,240 (being an average of £2530 for each 16th share). Adventurers Shares: Lots 39 to 47 inclusive, comprising seven lots, of 1-20th part each, of an undivided 36th share, or "Adventurers moiey," in the estates and interest of the New River; and two lots of 1-30th part each. The dividends on the Adventurers shares for 1869 amounted to £3106 1s. 6d.—£17,650 (being from £2050 to £2160 each for the first seven, and £1460 and £1600 for the two last lots). The whole of this large property, including £6000 debenture stock therein, bearing 4 per cent. interest, realized £62,429. The sale excited the greatest interest.

Register of New Patents.

1534.—RICHARD EDWARD KEEN, of Red Lion Court, Fleet Street, commission agent, for "*An improved mode of and means for securing panes of glass, more especially designed for street lamps or lanterns.*" Patent dated May 18, 1869.

This invention relates to a peculiar method of framing panes or sheets of glass without the use of putty, and is more especially designed for the lanterns of street or out-door gas lamps or burners and other lights where the glass is exposed to sudden changes of temperature, and is consequently liable to frequent fracture. In applying this invention to such a lantern, a metal frame is constructed, which is composed of an upper and lower band, united by bars at the corners of the lantern. The panes or sheets of glass are placed upon the outside of these corner bars, and are then secured by metal bars or clips of a V-shaped or concavo-convex sectional form. These clips extend from the top to the bottom of each pane, and are secured to the upper and lower bands of the frame by means of sockets, screws, pins, or other devices which will hold them firmly, but will also allow them to be readily removed when desired. The bottom of the frame is provided with a fillet to receive the lower edge of the panes of glass, and I prefer that this fillet should be perforated at the bottom to permit the escape of any water that might be caught therein. By thus securing the panes or sheets of glass within, or between strips or bars of metal, without putty or other adhesive substance, they are held with sufficient firmness to prevent any vibration or displacement in their frames, while at the same time the said frames permit them to freely expand and contract under the sudden changes of temperature to which they are exposed.

1572.—WILLIAM HENRY DUPRE, of Jersey, for "*Improved apparatus for giving light and ventilation to rooms, houses, or other buildings.*" Patent dated May 21, 1869.

This invention consists, first, in simplifying the form and construction of roof-lights, having for its object a more effectual method of inserting the glass within the valve-frame, through the medium of a rabbet or slider fitted with a hinged beading in which the glass is enclosed, and protected on all sides in conjunction with square or round corners, forming the base or bottom plate to the roof-lights. Second, in the employment and mode of opening and closing pane ventilators by means of sash weights and cords applied thereto, by which it is opened and shut as required, and fitted with wire gauze at the top of same for the exclusion of dust, insects, or otherwise.

1629.—JOHN SNAPE, of Mountain Ash, near Aberdare, South Wales, mechanical engineer, for "*Improvements in pumps.*" Patent dated May 27, 1869.

These improvements consist in fitting between the plunger or ram and the suction-valve a piston, the rod of which passes downwards through a stuffing-box, and has connected to it another piston working in the branch of a bent pipe leading to the outflow, and connected by a short connexion or valve-box to the suction-pipe, so that the valves are kept in a state of equilibrium by resting upon the columns of the water.

1637.—CHARLES PLUMB, of 21, Commercial Road, Lambeth, in the co. of Surrey, engineer, for "*An improved ratchet-brace, combining boring, tapping, screwing, and cutting-off apparatus.*" Provisional protection only obtained. Dated May 28, 1869.

In carrying out this invention an ordinary handle or lever is employed, encircling at one extremity a cylindrical head or centre-piece, upon the exterior of which is cut a ratchet. Attached to the handle are two pawls taking on to the opposite sides of the said ratchet, and so arranged that by turning a cam either can be thrown out of or into gear with the ratchet, thus allowing the ratchet-brace to be worked in either a forward or backward direction. The face of the cylindrical head is provided with an elongated recess for receiving plates or dies with apertures formed therein for the insertion of the butt-end of the drill-plates, with different sized apertures being used according to the size of the drill to be employed. These plates or dies are prevented from falling out of their places by means of a ring screwed over them on to the face of the cylindrical head, or by other suitable means.

1656.—ABRAHAM HEMINGWAY, of the city of Manchester, in the co. of Lancaster, engineer, for "*Improvements in slide-valves.*" Patent dated May 29, 1869.

According to this invention the back of the valve is made open, and is placed in the interior or plate, which rests on one or more rockers linked or toothed

to the plate, which plate is kept tight by a shelf of india-rubber or a metallic packing. When there is only one rocker it works on metal in the middle of the exhaust port or passage, and as the valve is moved to and fro, the rocker rocks on the metal, and thus the friction is reduced to a very great extent, there being only sufficient valve surface to keep the valve tight to its facing, and when there are two rockers they work on metal at the ends of the exhaust port or passage, and support the plate pressed by the steam or water.

1683.—HENRY HOLDREGE, of the city and state of New York, United States of America, gas engineer, for "*Improvements in the process of making gas for illuminating, heating, and other purposes, and in apparatus for the manufacture thereof.*" Patent dated May 31, 1869.

This invention consists in an improvement in the process and apparatus for thorough and rapid decomposition of steam into hydrogen and carbonic oxide gases, and (when illuminating gas is to be produced) their subsequent enrichment by hydrocarbons in other retorts charged with bituminous coal or other material. A more desirable product is thus obtained in the decomposing retort, and a better chemical union of these gases with those formed in the carbon retorts. The decomposing retort is made of fire-clay of close texture and tenacious quality, such as found in some German and similar clays, so that in manufacturing the retort the clay in the kiln will have a tendency to flux instead of forming a porous and brittle compound liable to disintegration. The retort may have a false or double bottom, or is provided with hollow grooved tiles lying upon its floor, and it is so constructed that steam may be introduced under such false bottom or into the front tiles near the mouthpiece of the retort, and flow to the back end, and, after being superheated, escape into another retort through small apertures in the bottom or tiles; the superheated steam is thus distributed in fine jets under the bed of incandescent coal. This retort is charged with American anthracite coal broken into pieces of the size of an egg. In combination with such retort there is a steam superheater placed horizontally in the hotter parts of the oven, and forming part of the setting of the bench of retorts. It is so constructed that steam admitted at the front end flows backward and then returns to the front, where it passes to the superheating and distributing chamber or tiles lying on the floor of the retort. In connexion with such superheater is a steam-drier, placed near the base of the oven where the heats are quite moderate, and which consists of a pipe enclosed within a larger pipe, the former being perforated with fine holes through which the steam escapes, and being deprived of its superabundant moisture by contact with the heated and drying surfaces, passes to the superheater, where it is more thoroughly superheated before its introduction into the retort for final superheating and distribution.

In making gas by decomposing water or steam by the aid of incandescent metal or carbonaceous material, it has been the practice to introduce the steam or water itself by a pipe into some part of the retort, into which it issues in a stream or volume according to the diameter of the pipe, thus bringing water as such or steam holding water in mechanical suspension, and far below thet emperature required for decomposition, into carbonic oxide and hydrogen gases, producing carbonic acid gas, and lowering the temperature of the retort, thus involving an unsteady and unsatisfactory flow of gases resulting from the more or less imperfect decomposition of water and serious loss in the whole process, and when more efficient means have been employed the steam has not been superheated before entering the retort to the temperature of the material within the retort, and then properly distributed among the surfaces of the incandescent charge within. The other retorts of the bench are furnished with bituminous coal or other material in the ordinary way.

The process is as follows:—The decomposing and other retorts being charged as above, steam from a boiler or generated in the bench is introduced into the steam-drier, passing thence to the superheater, and thence to the channels of the false bottom or tile flooring of the decomposing retort, where, having been previously highly superheated, it is further heated, and then distributed in fine jets among the mass of incandescent anthracite coal. The retort being kept at a high heat, the effect produced is the immediate decomposition of the steam, without reduction of the temperature of the retort or of the anthracite coal, thus securing a constant supply of the desired gases. These gases pass through a conducting-pipe (the decomposing retort having no stand-pipe) into the mouthpieces of the bituminous coal retorts, where they meet and mingle with the gases eliminated from the coal or material in such retorts before these reach the point of condensation in the hydraulic main. The gases from the decomposing retort may be supplied to one carbon retort until the rich carbon vapours pass off, and then be shut off by a cock and turned into another retort for an equal length of time, the two retorts being charged separately at intervals, and their charges being distributed during the last one or two hours without any supply of hydrogen.

When a gas for heating purposes is to be produced, the carbon or bituminous coal retorts need not be used in connexion with the hydrogen or decomposing retort, but the latter with the superheater and steam-drier will alone be operated, and the gas produced conducted therefrom to the gasholder through the usual condensers and purifiers.

1697.—JOHN FLETCHER, of Ashton-under-Lyne, in the co. of Lancaster, brass-founder and finisher, for "*An improvement in steam and other cocks applicable to union joints, which I call 'union cocks.'*" Patent dated June 2, 1869.

This invention consists in so arranging a steam or other cock that it not only answers the ordinary purpose of a cock for opening and shutting off the supply, but it also forms a union joint which may be readily uncoupled if required.

1715.—JOHN LLOYD, engineer to the Lilleshall Iron Company, near Shifnal, in the co. of Salop, for "*Improvements in the construction of fans for ventilating.*" Patent dated June 3, 1869.

The object of this invention is to construct the fans for ventilating purposes with a series of vanes or blades of varying lengths, and fitting them between two discs; one of the discs is solid, while the other has a hole in its centre through which the air is drawn. The solid disc is fitted to a face-plate, by which it is rotated, or a shaft may be fitted through the solid disc, and bolted on the inside of the same. Each blade is preferably formed of a segment of a circle.

1765.—ALFRED WILLIAMS, of 64, Bankside, Southwark, in the co. of Surrey, for "*Improvements in gas-stoves for cooking purposes.*" Provisional protection only obtained. Dated June 8, 1869.

This invention consists in constructing gas-stoves for cooking purposes with the sides formed of glazed fire-tile or enamelled iron, instead of ordinary iron as heretofore, whereby greater cleanliness and absence of the objectionable smells arising from ordinary gas cooking-stoves is ensured. For this purpose a framework of metal is constructed, into the open panels of which slabs or tiles of glazed fire-brick or enamelled iron are fitted, the door being constructed in a similar manner. The outer surface of the stove may be covered with a complete metal casing, if desired; or in place of fitting the glazed tiles or enamelled iron into a framework, they may be arranged as a complete lining, cemented or otherwise fixed into an outer casing of metal.

1810.—JOSEPH HADREY RIDDELL, of Cheapside, in the City of London, for "*Improvements in joints or connexions for uniting and securing together the ends of pipes or tubes.*" Patent dated June 12, 1869.

This invention relates to novel means for uniting and securing together the ends of sections or lengths of pipes or tubes employed for conveying water, gas, sewage, and other liquids or fluids, the said invention being applicable to pipes made of metal, earthenware, or other materials ordinarily employed for the purpose, though more especially designed to economize and facilitate the manufacture and laying down of cast-iron pipes.

To make the joints or connexions according to this invention, there is formed at one end of each length or section of pipe a socket or chamber to receive the end of the section to be connected therewith, the said socket being of such a diameter internally as to leave a space around the end of the pipe inserted therein for a loose packing-ring or collar of india-rubber or other suitable elastic or compressible substance. When the improved joints are applied to gas-pipes, it is preferred that the packing-ring should be of lead, and should be of a sectionally conical form, its broadest part being placed towards the bottom of the socket, and made with sharp corners, which, when the loose flange is forced down upon the packing-ring, will bind tightly upon the sides of the tube and socket. Ordinary hemp packing and other materials may also be used for this purpose. Outside this packing-ring, and upon the end of the pipe, is placed a loose flange, which is connected to the flange of the socket by bolts and nuts. By turning these nuts in the proper direction the loose flange will be drawn towards or into the socket upon the packing-ring. By this means the packing-ring is compressed or flattened between the face of the loose flange and the bottom or end of the socket, which is made conical, so that the packing-ring is compressed and caused to bind tightly against the interior surface of the socket and the periphery of the end of the pipe therein. The loose flange should be formed with a projecting circular rim or shoulder to enter the socket and ensure the effectual compression of the elastic packings in the conical bottom of the socket. It is preferred that the end of the pipe within the socket should be slightly enlarged, so that the packing-ring when compressed will hold the same in the socket with greater security. When the loose flange is properly screwed down upon the packing, the same will make the joint between the two portions or sections of pipe perfectly air and liquid tight, and will also secure the two sections together in such a manner as to prevent the separation thereof until the loose flange has been withdrawn from the socket. The sockets and flanges constructed in the manner above described can be moulded and cast with the same facility as ordinary flanged pipes or tubes, and can therefore be supplied at a very moderate cost.

1816.—EDWARD GRIFFITH BREWER, of 89, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in connecting pipes or tubes.*" A communication. Patent dated June 14, 1869.

The pipes or tubes constructed according to this invention are formed with a bevelled ring at each end, or in some cases at one end only; a ring of india-rubber or other analogous material divides as it were the bevelled ends of the pipes, which are themselves received in a ring, clip, or clips, also of a wedge-like form, and held together by a nut and bolt, the latter also being wedge-shaped.

1818.—JOHN TAYLOR, engineer, of 27, Russell Street, Bermondsey Street, S.E., for "*A floating and sliding top for wells, tanks, cisterns, or any other kind of vessel for keeping or holding water, fermented or unfermented, or any other kind of liquor.*" Patent dated June 14, 1869.

The top is constructed so as to rest on the liquor; at the sides is fitted a band made of canvas, india-rubber, or any other flexible material; this is made to fit the sides of the tanks or cisterns. In order to draw out or let in the liquor a pipe is passed through a stuffing-box fixed on the top. As the liquor is drawn out the top is free to descend, or the liquor let in the top is free to ascend, hermetically excluding the air from the liquor while drawing out or filling the tanks, wells, or cisterns.

1858.—BRISTOWE HUNT, of 1, Serle Street, Lincoln's Inn, in the co. of Middlesex, gentleman, for "*An improved apparatus for ventilating and purifying rooms or apartments.*" A communication. Patent dated June 16, 1869.

This invention consists in constructing an apparatus containing ice, and placing the same in such a position and manner in a room or apartment as to secure a proper circulation of air therein, the ice receiving the deposits of the impure particles contained in the moist or warm air of the room, at the same time drying and cooling the moist or warm air passing over it.

1872.—JOHN GARRETT TONGUE, of the firm of Tongue and Birkbeck, patent agents and engineers, of 34, Southampton Buildings, Chancery Lane, in the co. of Middlesex, for "*The production of novel and ornamental effects in the manufacture of various articles of glass applicable to various ornamental and other objects, and to lamp-shades, globes, reflectors, or other transparent or semi-transparent articles made of glass, and in means or apparatus employed for the above purpose.*" A communication from abroad. Patent dated June 18, 1869.

In glass working, under the term "calcination of glass," is described the crevices, cracks, or rents which are produced upon the surface of a piece of glass when this piece is transferred suddenly from an intense heat to an extreme cold, and this invention has for its object the application of the effect of calcination (granulation, fissuring, or cracking), consequent upon the sudden contraction of the surface of heated glass when brought in contact with water, to the production of regular and irregular designs upon various articles, more particularly those which are employed to reflect or transmit light, such as globes, shades, reflectors, lamp-glasses, or other transparent or semi-transparent articles made of glass.

1922.—HENRY ALEXANDER FREDERICK DUCKHAM, of Camden Town, in the co. of Middlesex, gas engineer, for "*Improvements in gas-regulators.*" Patent dated June 23, 1869.

This invention relates to improvements in gas-regulators, and is more especially applicable for regulating the supply of gas to the burners of railway-carriages, and in other cases in which the gas is stored under high and varying pressures. The regulator consists of a valve carried on a lever arm hinged at one end near the orifice at which the gas arrives, and connected at the other to the centre of an india-rubber or other diaphragm, the whole being contained within a suitable air-tight casing. The valve may either be formed of a spherical or other shaped part projecting from the lever arm near its fulcrum, and received in a suitable socket or seat when the valve is closed, or it may be formed simply by the surface of the lever-arm abutting against the orifice on the nozzle at which the gas arrives for the purpose of closing the same. The apparatus is contained in a suitable casing as before mentioned, from which the gas is conducted to the burners as usual. Should the pressure of the gas be great or small in proportion to the rate of consumption, the valve will be partially closed or opened, as the case may be, until a suitable pressure is attained. This is effected automatically by the increase or diminution of pressure of the gas passing through the apparatus on the diaphragm before mentioned as being connected to the end of the lever arm. The relative positions of the valve and diaphragm may be adjusted permanently by means of a set screw connecting the lever-arm with the diaphragm.

APPLICATIONS FOR LETTERS PATENT.

1467.—ALBERT MARCUS SILBER, of Wood Street, Cheapside, in the City of London, merchant, and FREDERICK WHITE, of Camberwell, in the co. of Surrey, watchmaker, for "*Improvements in apparatus for lighting and heating purposes.*" May 20, 1870.

1472.—THOMAS HOLT LLOYD, of Stockport, in the co. of Chester, engineer, for "*Improvements in the construction and arrangement of valves for regulating the supply or discharge of steam, water, and other fluids.*" May 21, 1870.

1477.—HENRY HIND, of the town and county of the town of Nottingham, engineer and tool manufacturer, and GEORGE WELLS, also of the said town, engineer, for "*Improvements in steam and other valves.*" May 21, 1870.

1485.—Martin Benson, of Southampton Buildings, London, consulting engineer, for "*Improvements in the mode of supplying lamps or lanterns with atmospheric air for supporting their illuminating flames.*" A communication. (Complete specification.) May 23, 1870.

1486.—Alfred Long, of 22, Aylesbury Street, Walworth, in the co. of Surrey, for "*Improvements in means for regulating the flow or controlling the supply of water or other fluids.*" May 23, 1870.

1495.—John Fletcher, of 6, Bridgewater Street, Broughton Road, Salford, in the co. of Lancaster, for "*Improvements in coking and desulphurizing the coke after obtaining the gases, oils, and other products from coal, and the machinery or apparatus employed therefor.*" May 24, 1870.

1500.—William Edward Newton, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in earth-closets, applicable also in part to water-closets and privies.*" A communication. May 24, 1870.

1513.—Charles William Siemens, of 8, Great George Street, Westminster, in the co. of Middlesex, for "*Improvements in regenerative gas-furnaces, and apparatus connected therewith, for the manufacture of glass; also partly applicable to regenerative gas-furnaces generally.*" Partly communicated. May 25, 1870.

1514.—George Thomas, of Colchester, in the co. of Essex, bank manager, for "*Improvements in the construction of gas-stoves.*" May 25, 1870.

1524.—David Jones, of Clerkenwell, in the co. of Middlesex, for "*Improvements in the manufacture and treatment of coal gas for illuminating purposes.*" May 26, 1870.

1560.—William Cleland, of Linacre, near Liverpool, in the co. of Lancaster, manager of gas-works, for "*Improved means and apparatus for exhausting, forcing, and purifying gas for heating and illuminating purposes.*" May 28, 1870.

1570.—Charles Denton Abel, of 20, Southampton Buildings, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in the manufacture of wrought-metal tubes, and in machinery or apparatus employed for that purpose.*" A communication. May 30, 1870.

GRANTS OF PROVISIONAL PROTECTION.

1357.—William Edward Newton, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in the construction of steam valves or cocks.*" A communication. May 12, 1870.

1363.—Henry Law, of 15, Essex Street, Strand, in the co. of Middlesex, civil engineer, for "*Improvements in meters for measuring fluids, and in packings and counting apparatus to be used therewith, parts of which improvements are applicable to engines for obtaining motive power from fluids under pressure and to other purposes.*" May 13, 1870.

1403.—James Yates, of Birmingham, in the co. of Warwick, manufacturer, for "*Improvements in taps or stop-cocks.*" May 16, 1870.

1410.—Charles Hunt, of Nine Elms, in the co. of Surrey, engineer, for "*Improvements in retorts and retort-settings.*" May 17, 1870.

1449.—Robert Pitt, of the firm of Stothert and Pitt, of Newark Foundry, Bath, in the co. of Somerset, engineers, for "*Improvements in valves for drawing off water and other fluids, applicable to water-cranes, and for other uses.*" May 19, 1870.

1455.—Joseph Breeden, of the firm of J. and W. Breeden and Booth, of Birmingham, in the co. of Warwick, manufacturers, for "*Improvements in lift and force pumps.*" May 19, 1870.

1456.—Alexander Melville Clark, of 53, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in apparatus for the production of gases for lighting and heating purposes.*" A communication. May 19, 1870.

1467.—Albert Marcius Silber, of Wood Street, Cheapside, in the City of London, merchant, and Frederick White, of Camberwell, in the co. of Surrey, watchmaker, for "*Improvements in apparatus for lighting and heating purposes.*" May 20, 1870.

1472.—Thomas Holt Lloyd, of Stockport, in the co. of Chester, engineer, for "*Improvements in the construction and arrangement of valves for regulating the supply or discharge of steam, water, and other fluids.*" May 21, 1870.

1477.—Henry Hind, of the town and county of the town of Nottingham, engineer and tool manufacturer, and George Wells, also of the said town, engineer, for "*Improvements in steam and other valves.*" May 21, 1870.

1486.—Alfred Long, of 22, Aylesbury Street, Walworth, in the co. of Surrey, for "*Improvements in means for regulating the flow or controlling the supply of water or other fluids.*" May 23, 1870.

1495.—John Fletcher, of 6, Bridgewater Street, Broughton Road, Salford, in the co. of Lancaster, for "*Improvements in coking and desulphurizing the coke after obtaining the gases, oils, and other products from coal, and the machinery or apparatus employed therefor.*" May 24, 1870.

1500.—William Edward Newton, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in earth-closets, applicable also in part to water-closets and privies.*" A communication. May 24, 1870.

1514.—George Thomas, of Colchester, in the co. of Essex, bank manager, for "*Improvements in the construction of gas-stoves.*" May 25, 1870.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF A COMPLETE SPECIFICATION.

1485.—Martin Benson, of Southampton Buildings, London, consulting engineer, for "*Improvements in the mode of supplying lamps or lanterns with atmospheric air for supporting their illuminating flames.*" A communication. May 23, 1870.

NOTICES TO PROCEED.

464.—Laurent Lucon and Zoé Peigné Widow Kern, of Nantes, and of 37, Boulevard Bonne-Nouvelle, Paris, in the empire of France, for "*An improved horizontal pump.*" Feb. 17, 1870.

1314.—Astley Paston Price, of 47, Lincoln's Inn Fields, in the co. of Middlesex, consulting chemist, for "*Improvements in the treatment of sewage, and in the production of manures.*" May 7, 1870.

1335.—William Robert Lake, of Southampton Buildings, London, consulting engineer, for "*Improvements in apparatus or machinery for making gas from liquid hydrocarbons for illuminating purposes.*" A communication. May 10, 1870.

1354.—George William Wigner, of 1, St. Swithin's Lane, in the City of London, analytical chemist, for "*Improvements in deodorizing and purifying sewage, and in making manure therefrom.*" May 12, 1870.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1474.—James Theodore Bland and Edwin John Bland and Thomas Brevetor, "*An improved apparatus for more effectually regulating the supply of water or other fluids to cisterns or other receptacles, and for economizing the trouble and expense connected therewith.*" May 18, 1867.

1487.—Thomas Metcalf, "*Improvements in burning all hydrocarbon oils, such as creosote, petroleum, paraffin oil, shale oil, gas tar, and other similar products capable of being used as fuel.*" May 20, 1867.

Advertisements.

FLETCHER, SPECK, & CO.,

CONTRACTING GAS ENGINEERS, IRON & BRASS FOUNDERS,

GLENGALL IRON-WORKS, MILLWALL, LONDON, E., and **RATCLIFF FOUNDRY, COMMERCIAL ROAD EAST, LONDON, E.,**

Manufacturers of **Gasholders, Tanks, Purifiers,** and every description of **Gas-making Apparatus.** Iron Main-pipes supplied and laid. Retorts, Mouthpieces, Retort-lids, Valves, and Fittings. Wrought and Cast Iron Hydraulic Mains. Improved **Wrought-Iron Column Stills,** for working **Ammoniacal Liquor. Chemical Plant** for **Gas-Works** erected complete, on the most approved system. Lamp-posts, Columns, Girders, Bridges, &c.

CORRUGATED IRON ROOFS & BUILDINGS.

GENERAL GAS CASTINGS PROMPTLY EXECUTED.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

CAST AND WROUGHT IRON GIRDERS, BRIDGES, AND ROOFS,

STEAM-ENGINE BOILERS, & GENERAL WROUGHT-IRON WORK.

London Agents: PORTER and LANE, 172, FENCHURCH STREET, E.C.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1 in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.		Glasgow.		Newcastle and Middlesboro'.			Wales.			Yorkshire, Derbyshire, and Staffordshire.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
Pig Iron, No. 1 (g.m.b.)	3	17	6	2	10	6	3	14	0	3	10	0	3	15	0
1¼ and 2-inch Socket-pipes	7	0	0	5	15	0	5	10	0	6	0	0	7	0	0
2½ and 3-inch ditto	6	10	0	5	5	0	5	0	0	5	15	0	6	10	0
4 and 5-inch ditto	6	0	0	4	15	0	4	10	0	5	5	0	6	0	0
6 inches and upwards ditto	5	15	0	4	5	0	4	0	0	5	0	0	5	15	0
Retorts, 1st fusion, hot blast	5	10	0	4	10	0	4	5	0	5	0	0	5	10	0
Ditto, 2nd ditto, cold ditto	6	10	0	—			—			—			6	10	0
Tank-plates, ¾ thick and above	6	0	0	5	0	0	4	15	0	5	10	0	6	0	0

WROUGHT-IRON TUBING,

Subject to 60 per cent. Discount.

	2 in.		1½ in.		1¼ in.		1 in.		¾ in.		½ in.	
	s.	d.	s	d.	s.	d.	s.	d.	s.	d.	s.	d.
Patent Welded Tubes, from 2 to 14 feet—per foot	1	8	1	1	0	10	0	7	0	5	0	4½
Ditto ditto, from 12 in. to 23½ in.—each	3	0	2	0	1	6	1	1	0	9	0	8
Long Screws, from 12 in. upwards	4	0	2	3	2	0	1	6	1	2	0	11
Bends and Springs	4	3	2	3	1	9	1	3	0	11	0	8
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3	9	2	3	1	9	1	3	0	10	0	8
Tees, wrought or cast	4	0	2	6	2	0	1	6	1	1	0	9
Crosses, ditto, equal or reducing	4	9	3	6	3	0	2	3	1	9	1	6
Iron Cocks	20	9	13	0	10	0	7	3	5	0	3	5
Ditto, with brass plug	28	0	16	0	13	0	7	0	5	6	4	6
Diminishing Sockets, Caps, Plugs, and Nipples	1	3	0	9	0	8	0	6	0	5	0	4½
Plain Sockets	1	0	0	8	0	7	0	5	0	4	0	3
Syphons, 2-quart	15	0	14	0	13	6	13	0	12	0	—	

GAS COALS.

Newcastle—Unscreened:—	Per Ton.
Haswells, Nettlesworth Primrose, and South Pelaw	6s. 6d.
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	6 9
Burnhope, Craghead, Charlaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	7 0
Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	15 9
Wigan Cannel (at Liverpool)	17 0
Welsh Cannel:—	
Coppa Cannel (on rails at Birkenhead), 13s. 6d.; ditto (on rails at Connah's Quay)	13 0

Scotch Cannel, f.o.b.:—	Per Ton.	*Scotch Cannel*, f.o.b.:—	Per Ton.
Boghead—at Bo'ness, 47s. 6d.; at Leith	48s. 2d	Arniston (at Leith)	21s. 0d
Muirkirk	27 0	Wemyss (at Wemyss)	20 0
Kirkness, best (at Burntisland)	22 6	Haywood and Co.'s Haywood (at Granton)	20 0
Capeldrae, 1st quality (at ditto)	22 6	Pirnie, or Methill	17 0
Ditto, 2nd ditto (at ditto)	17 6	Lothian's Cannel (at Leith)	21 2
Cowdenbeath (at ditto)	12 0	Grange ditto (at Bridgeness)	17 6
Lochgelly (at ditto)	12 0	Kinniel ditto (at Bo'ness)	17 6
Donnibristle—at Burntisland, 12s.; at Aberdour	12 6	Myles' ditto	23 6
Auchinheath Lesmahago (at Granton)	27 0	Lochore Parrot (at Burntisland)	22 6
Nitshill and Lesmahago Coal Company (at Granton)	26 6	Lancmark (at Glasgow)	16 0
		Elphinstone Tower (at Leith)	20 0

FREIGHTS.

Coastwise—Newcastle:—	Per Ton.	*Foreign:—*	Per Keel.
Chatham and Rochester	5s. 9d. to 6s. 3d	Barcelona	£19 0s
Cork	9 6	Bordeaux	12 0
Dover, Folkestone, and Ramsgate	6 9	Boulogne and Calais	8 0
Dublin	10 0	Cadiz	11 10
Exeter Quay	9 6	Cronstadt	12 0
Ipswich	5 0	Copenhagen	8 10
London (from Leith)	8 6	Genoa	17 0
London (Pool)	5 9	Hamburg	8 10
Lowestoft and Yarmouth	4 6	Havre de Grace	10 0
Portsmouth & Southampton	6s. 6d. to 7 0	Leghorn	17 0
Plymouth	8 6	Lisbon	12 0
Shoreham	7 0	Rotterdam	8 0
Whitstable	6s. 9d. to 7 0	Stettin	9 15
Weymouth	8 0	Trieste	17 0
		Venice	18 10

SUNDRIES.

Best Newcastle Fire-bricks, per 1000	£2 10s. to £2 15s. 0d.
Cliff's Fire-bricks (at Wortley), per 1000	2 15 6
Ingham's ditto (at Wortley), per 1400	2 18 0
Farnley Iron Co.'s Fire-bricks (at Wortley), less discount	2 17 0
Fire-clay Retorts, per foot run	5s. 6d. to 0 7 6
Tarred Rope Yarn, per cwt.	1 0 0

CHEMICAL, MINERAL, AND METAL MARKETS.

[*From* J. Berger Spence and Co.'s *Weekly Report.*]

Soda.—Crystals experience an excellent demand at £4 to £4 5s. Cream Caustic Soda is active, at £12 10s. for 60 per cent.; and White, at £13 to £13 10s. Bicarbonate, £9 5s., and £15 for Refined. Saltcake, brisk at 58s. Soda Ash firm, at 11l-16d. to 1¾d. per degree. Sulphate of Soda, £3.——Nitrate of Soda is in rather quiet request, and prices rule at £15 to £15 10s. on the spot.——Potash.—For Muriates the demand has slightly slackened, but £8 7s. 6d. to £8 12s. 6d. may be quoted for 80 per cent.——Saltpetre.—Foreign ranges from 23s. for inferior per centages, to 26s. 3d. for 4½ per cent. English Refined, 28s. to 28s. 6d.——Alum is in steady demand, at £6 5s. for Loose Lump, and £7 in export barrels; Ground, at £7.——Ammonia.—Brown Sulphate not quite so active as usual, but without alteration, at £13 to £13 10s. White and Grey inquired for at £15 to £16 5s.——Copperas.—Green and Rusty meet with a better market, and 52s. is fully maintained. Dry in average request, at 52s.——Arsenic, at £7 to £7 5s. for Fine Powdered.——Acid.—Oxalic steady at 8d. Tartaric quieter, but firm at 1s. 2½d. to 1s. 3½d. Sulphuric, at £3 15s. per ton.——Magnesia.—Epsom Salts, at £4 10s. to £4 12s. 6d. for Refined.——Oils.—Mineral Refined, at 1s. 1½d. to 1s. 3d.; Olive, £48 to £50; Purest Norwegian Cod Liver Oil, at £9 10s. per barrel of 25 gallons.——Pitch.—There is some appearance of an improvement in this article, an advance on previously quoted prices having been offered, but refused.——Guano.—Best Peruvian, £13 7s. 6d. to £13 10s.——Disinfectants.—Carbolic Acid quiet, at 1s. to 1s. 3d. per lb. Patent, at £5 per ton, for sewage purposes.——Pyrites.—Much the same, and firm at 6½d. to 7¼d. per unit. Calcined Spanish, at 43s. 6d. R.C.——Lime.—Bleaching Powder is animated, at £8 to £8 5s. Superphosphates moderately active, at £4 to £4 5s. Mineral Phosphates, at 54s. for 65 per cent.——Manganese.—At 80s. for 70 per cent.——Iron Ore.—Hematite, 13s.; Oolitic, 6s. 6d. to 8s. 6d. in Staffordshire, and 2s. 9d. free on rails, with a steadily increasing demand.

Iron.—Scotch Pig steady at 60s. to 60s. 3d.; Cleveland advanced to 52s. for Forge 4, and 56s. 6d. for No. 1; Welsh Bars, £6 10s. to £7; Staffordshire Bars, £7 10s. to £8 10s.; Hoop Iron, £9; Gas Tubes, 60 per cent. to 67½ per cent. off list; Boiler Tubes, 40 per cent. to 42½ per cent.——Copper.—Rather firmer. English Tough Ingot, £70 10s. to £71 10s.; Chili Slab, £67 10s. to £68 10s.——Tin.—In good inquiry. English Ingot, £135 to £136; Straits, £134 to £135.—— Lead.—Quiet. P.G. Best English Soft Pig, £18 10s.——Spelter.—Inanimate. English, £19 10s. to £20. Silesian, special brands, £19 5s. to £19 10s.

Share List of Metropolitan Gas Companies.

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£		£ s. d.	£ s. d.	£
8000	10	Anglo-Romano	10 0 0	10 0 0	11 — 12
5000	20	Bahia (Limited)	20 0 0	3 0 0	13 — 14
1000	20	Do., preference	20 0 0	10 0 0	22 — 23
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	4 10 0	5⅜ — 6¼
10000	5	Do., third issue	4 0 0	4 10 0	4¾ — 5¼
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge, & Holywell.)	20 0 0	10 0 0	30½ — 31½
7500	20	Cagliari (Limited)	20 0 0	7 0 0	
12000	50	*Chartered*	50 0 0	8 0 0	68 — 69
6000	50	Do.	45 0 0	8 0 0	63 — 64
30000	10	Do., preference	2 0 0	5 0 0	3 — 3½
10000	20	*City of London*, A shares	20 0 0	9 0 0	24 — 26
10000	10	Do., B shares	10 0 0	4 0 0	6¾ — 7
9629	10	Do., new shares	10 0 0	9 0 0	12½ — 13
17490	25	*Commercial*	25 0 0	10 0 0	41 — 42
20000	20	Continental Union	20 0 0	8 0 0	28 — 29
10000	10	Do., new	5 0 0	..	9 — 9½
5213	20	Do., preference	20 0 0	7 0 0	25 — 26
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 16½
5000	10	Do., preference	10 0 0	6 0 0	11 — 11½
10000	10	Do., new shares	10 0 0	7 0 0	12 — 12½
4000	50	*Equitable*	50 0 0	10 0 0	82 — 84
4000	25	Do., new shares	25 0 0	10 0 0	41 — 42
23406	10	European (Limited)	10 0 0	11 0 0	18 — 18¾
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	11 0 0	9¼ — 10
20000	10	*Great Central Gas Consumers*	10 0 0	..	18 — 19
5000	10	Hong Kong (Limited)	10 0 0	7 0 0	11 — 12
26000	50	*Imperial*	50 0 0	10 0 0	84 — 85
26000	10	Do., new shares	7 0 0	10 0 0	12¾ — 13
26000	12½	Do., new shares	12 10 0	7 0 0	15 — 15¼
1300	100	Do., bonds	£100	10 0 0	175 —180
28000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	18 5 0	140 —141
400	100	Imperial Mexican (Limited)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent*	40 0 0	10 0 0	64 — 65
3000	10	Do.	10 0 0	5 0 0	7 — 9
3000	20	Do.	15 0 0	7 10 0	17 — 18
7133	50	*London*	50 0 0	10 0 0	82 — 84
5610	25	Do., 1st preference	25 0 0	6 0 0	28 — 30
503	50	Do., 2nd preference	50 0 0	6 0 0	
214	50	Do., 3rd preference	50 0 0	6 0 0	
£18781		Do., 1st preference stock		6 0 0	
£11828		Do., 2nd preference stock		5 0 0	
15000	5	Nictheroy, Brazil (Limited) Malta and Mediterranean (Limited)	5 0 0	3 10 0	3¾ — 4
6000	5	Do., preference	5 0 0	7 0 0	4¼ — 5¾
30000	5	Oriental (Calcutta)	5 0 0	10 0 0	8 — 8½
30000	5	Do., new shares	1 10 0	10 0 0	3 — 3½
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2½
14000	10	Pará (Limited)	10 0 0	10 0 0	10 — 11
27000	20	*Phœnix*	20 0 0	10 0 0	33 — 34
3600	100	Do., new	40 0 0	7 10 0	45 — 47
144000	8k.	Do.	100 0 0	5 0 0	83 — 86
5000	20	*Ratcliff*	20 0 0	10 0 0	27 — 28
	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	28½ — 29
6959	5	Singapore (Limited)	5 0 0	5 0 0	
2000	5	Do., preference	5 0 0	7 10 0	
1500	32½	Shanghai	32 10 0	12 0 0	
4000	50	*South Metropolitan*	50 0 0	10 0 0	82 — 85
4000	12½	Do.	12 10 0	10 0 0	20 — 22
20000	12½	Do., new shares	1 0 0	10 0 0	3 — 3½
15000	10	*Surrey Consumers*	10 0 0	10 0 0	16 — 16½
10000	10	Do., new	6 0 0	10 0 0	9 — 9½
9000	4	United General (Limerick)	4 0 0	5 0 0	2¼ — 2¾
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	10 — 12
1500	10	Do.	10 0 0	7 10 0	
1819	10	Do.	10 0 0	7 10 0	
1138	10	Do.	5 0 0	7 10 0	
20000	10	Western (Limited) A shares	10 0 0	10 0 0	17 — 17¼
10000	10	Do., B shares	8 0 0	10 0 0	14¼ — 15
10000	10	Do., C shares	8 0 0	10 0 0	13 — 13½
20000	10	Do., D shares	1 0 0	10 0 0	2½ — 3
16000	5	*West Ham*	5 0 0	7 10 0	7 — 7¼
551	10	West London Junction (Limited)	10 0 0	6 0 0	
520	10	Do., preference	10 0 0	6 0 0	

THE

DUKE OF HAMILTON'S

LESMAHAGOW

CANNEL COAL.

LESSEES:

THE NITSHILL & LESMAHAGOW COAL COMPANY.

OFFICE:

37, ST. VINCENT PLACE,

GLASGOW,

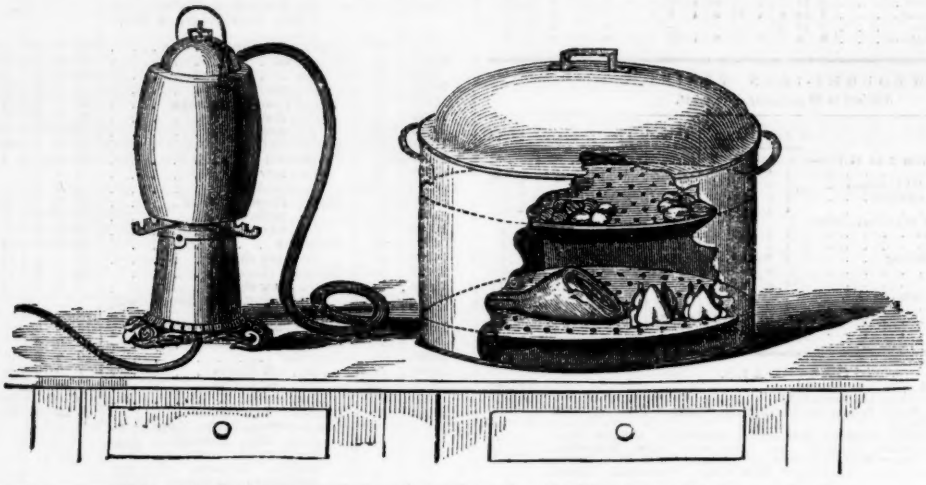
Where all communications are requested to be addressed.

JOHN WRIGHT & CO.,

30, BROAD STREET, ISLINGTON, BIRMINGHAM.

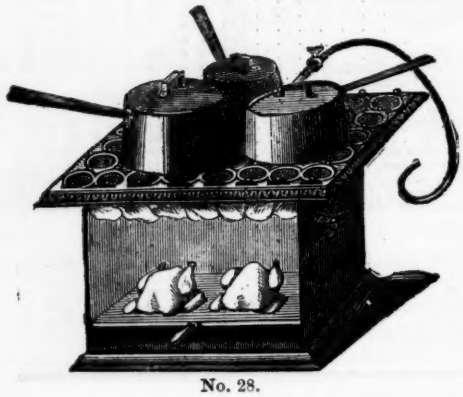
WRIGHT'S IMPROVED STEAMER,

Heated by a small Gas-Burner.



The above drawing represents a most effective, economical, and cleanly mode of cooking during the summer months.
By it two or three joints, several puddings, and three or four kinds of vegetables can be cooked by one small Burner.
The Boiler holds 5 gallons, and is heated to boiling-point under an hour.
By means of a Tube the steam is conveyed to the cooking vessel, which may be placed in another apartment from the Stove.
The advantages of cooking by steam over boiling are manifold; amongst others, three or four joints may be put into the steam vessel and cooked without tasting one of the other. While meat *boiled* loses weight and becomes sodden, if steamed it gains in weight—the difference being from 6 to 10 per cent. Again, the liquor that remains in the Steamer makes good broth with the addition of a few herbs.
Again, no pudding requires to be put into a bag, but simply laid in the Steamer, or if light put into a basin. In fact, the advantages can never be realized by any one unacquainted with this mode of cooking.
But it is evident that as the Gas and Boiler can be in a back kitchen or scullery, while the Steamer is in the kitchen, cooking can be going on without the unpleasantness of a heated kitchen in the summer.

Price, complete with Gas Stove, Boiler, and Steamer, with Steam-tight Nozzles, £4 10s.



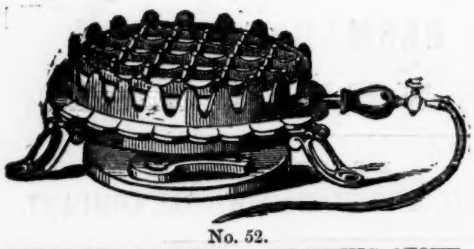
No. 28.

WRIGHT'S
IMPROVED GAS COOKER,

For BOILING, BROILING, and TOASTING.

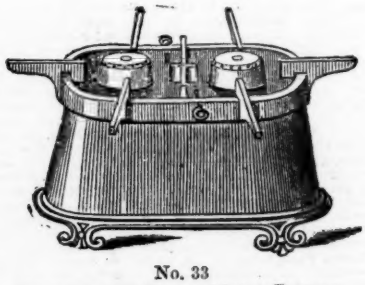
Price 45s.

This Stove effectually and economically boils three or four saucepans, and cooks (by reflection) chops, steaks, a small joint, or pair of fowls.
It also makes toast, and acts very nicely as a salamander.
As the heat can be regulated to the greatest nicety, it is highly recommended for making preserves, stews, or anything requiring gentle boiling.
It is a most useful apparatus in any kitchen, and in large establishments will be found a very valuable auxiliary.



No. 52.
IMPROVED BOILING & BROILING STOVE.
This is a very powerful Stove, with Atmospheric Burner; will broil under and boil above at the same time.
Price 15s.

No. 102.
This is a very effective Stove, with brass Burner.
Price 4s. 6d.



No. 33
Is a serviceable Stove with two Burners.
Price 10s. 6d.
12 feet prepared Tube for ditto, 4s.
Cock and Nozzle for ditto, 1s. 6d.

32½ per cent. Discount to the Trade.

JOHN WRIGHT & CO.,

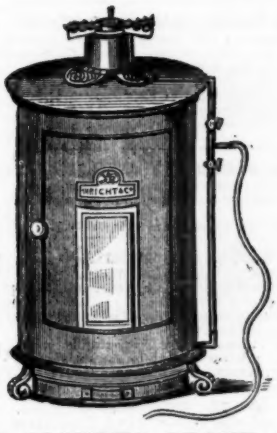
30, BROAD STREET, ISLINGTON, BIRMINGHAM.

WRIGHT'S IMPROVED GAS COOKING STOVES.

SQUARE COOKING STOVE, No. 65,

With Cast-Iron Top and Bottom, Door, and Frame.

14 in. square, with small Boiling Stove on top	£3 10 0
16 in. square, with one large Boiling and Broiling Stove on top	4 5 0
18 in. square, with two small Boiling Stoves, and one large Boiling and Broiling Stove on top (as drawing)	5 5 0
24 in. square, with 2 folding doors; 2 small Boiling Stoves, and one large Boiling and Broiling Stove on top	7 10 0



ROUND COOKING STOVE, No. 68,

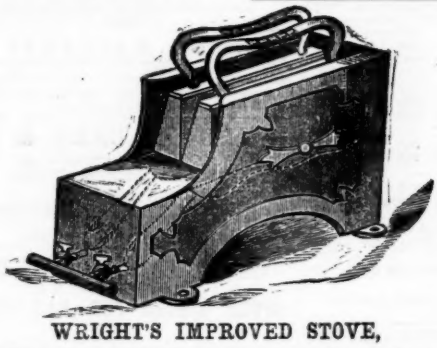
With Cast-Iron Top and Bottom, and Glass Door.

11 in. diameter	£1 15 0
14 in. diameter	2 2 0
16 in. diameter	2 12 6
18 in. diameter	3 3 0

All the Boiling and Broiling Stoves are Atmospheric.

For Roasting, Broiling, Frying, Baking, Boiling, Stewing, or Preserving, either together or separately.

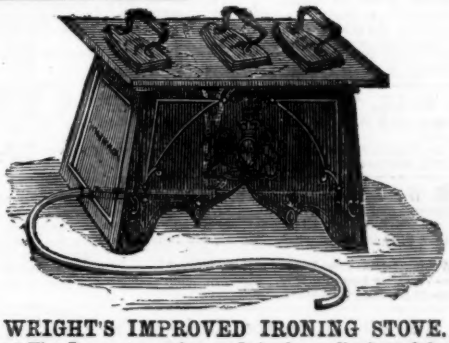
The advantages of Gas Cooking are—Its portability and cleanliness; perfect and immediate control over the heat; it requires but little attention; there is no roasting or baking fire to make up; it is always ready; it keeps the kitchen and house cool; it is economical even where gas is dear, and it is only alight while actually in use.



WRIGHT'S IMPROVED STOVE,

With Atmospheric Burner, for Heating Tailors' Irons.

Price: For 1 Iron, 15s.; 2 Irons, 20s.; 3 Irons, 25s.; 4 Irons, 30s.



WRIGHT'S IMPROVED IRONING STOVE.

Will heat 3 Flat Irons at one time. It is also well adapted for Hatters' Irons. Price 10s. 6d.

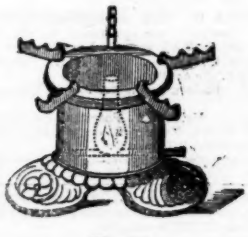
12 ft. of prepared Tube for ditto, 4s. Cock and Nozzle for ditto, 1s. 6d.

No. 55.

Same Stove as Nos. 35 and 45, but larger.

Price 7s. 6d.

12 feet prepared Tube for ditto, 4s.
Cock and Nozzle for ditto, 1s. 6d.



No. 36,

With Gauze Wire.

Price 2s.

No. 35.

Price 3s. 6d.

No. 45.

Same Stove as No. 35, but larger and stronger. **Price 5s. 6d.**

12 feet prepared Tube for ditto, 4s.
Cock and Nozzle for ditto, 1s. 6d.

32½ per cent. Discount to the Trade.

GAS-METER INSPECTOR.

WANTED, by the Banbury Gas Company, a young MAN to inspect and read meters, lay service-pipes, and repair fittings to public lamps. He would have the entire charge of meters, &c.

Apply, stating age and wages required, to the MANAGER, Gas-Works, Banbury, OXON.

WANTED, by the Falmouth Gas Company, a MANAGER, where the make is about 20,000,000 cubic feet per annum. The number of consumers meters is about 600. The Manager will have a house in the yard, worth £20 per annum, free of rent and taxes, with coal and gas also free. He would be required to superintend the laying of mains and services and the setting and removal of meters. A married man without family preferred

Applications, with references, stating salary required and when disengaged, to be sent to the FALMOUTH Gas, Coal, and Coke Company, Limited.

WANTED, a Gas Engineer of experience fully competent to take charge of the Kingston-upon-Thames Gas Company's Works. Salary £250 per year, with residence on the works.

Applications by letter only, endorsed "Gas Engineer," stating age and qualifications, and enclosing copies of testimonials, to be addressed to the SECRETARY of the Company, Church Street, KINGSTON, on or before the 15th of June inst.

WANTED, a situation as Manager, Inspector, or Assistant under an Engineer. Twenty years experience at home and abroad. Aged 41. Would go abroad.

Address GAS, 4, Nassau Street, SOHO SQUARE, W.C.

WANTED, a Man to undertake the management of the Crawley Gas-Works. He will be required to lay services and do all the labour at the Gas-Works, with an assistant in the winter.

A comfortable cottage with garden, also fuel and one gas-light, are provided on the works.

Application to be in own handwriting, stating wages required, and giving references, sent to the SECRETARY, Gas-Works, Crawley, SUSSEX, on or before the 18th inst.

WANTED, by an experienced Man, aged 34, a situation as WORKING MANAGER or FOREMAN in a Gas-Work, or as Outdoor Foreman and Meter Inspector. No objection to fill up time at fitting. Good references.

Address G. M., 22, Hight Street, Aldershot, HANTS.

BOROUGH OF SOUTHPORT.

WANTED, by the Corporation of Southport, a thoroughly competent MANAGER for the Gas-Works. Ability to draw plans and give specifications for future extension of works is desirable. Applicant should also possess a knowledge of the manufacture of naphtha and sulphate of ammonia. Salary £140 a year, with house, coals, gas, and rates.

Apply by letter, with testimonials, stating age, number of family, &c., addressed to the Chairman of the Gas Committee, Town-Hall, Southport, on or before the 4th of June, 1870.

By order,
KEIGHLEY WALTON, Town-Clerk.

A Young Man, brought up on a Gas-Work, wishes for a situation as CLERK or GENERAL ASSISTANT to the Manager. Used to gas accounts, gas-testing, and all matters connected with the business.

Address N. H. H., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, Two Purifiers, 3 ft. 6 in. square by 2 ft. 9 in. deep, with Clayton's six-way centre-valve.

Apply to CLAYTON, SON, AND CO., Gas Engineers and Contractors, Hunslet, LEEDS.

FOR SALE, Five Cast-Iron Guide Columns and Girders.

Five Grooved Wheels in sliding carriages. The columns are 26 ft. long, 12 in. diameter at the base, and 10 in. at the top.

The Wrought-Iron Framing for a 40-ft. Gasholder.

Centre-Valve for Four Purifiers, with 6-in. connexions.

Address MANAGER, Gas-Works, NEWBURY.

TO BE SOLD, on the Works of the Wolverhampton Gas Company, 136 ft. of Cast D Hydraulic Main, 18 in. by 18 in.

120 4-in. Bridge and Dip Pipes.

120 Stand-Pipes, tapering from 5 to 4 in.

80 15-in. Round Mouthpieces for clay retorts.

30 18 by 13 D Mouthpieces for ditto.

The whole or any part thereof at £4 per ton.

200 15-in. Wrought-Iron Lids for Retort Mouthpieces, at 12s. per cwt.

For further information, apply to JOHN ANNAN, Manager.

SHIPLEY GASLIGHT COMPANY.

TO BE SOLD, the following Gas Apparatus—viz., One set of Four Purifiers, 9 ft. by 6 ft., with 6-in. connexions and hydraulic centre-valve complete; Two Circular Scrubbers, one 3 ft. 3 in. by 9 ft., the other 5 ft. by 10 ft., with 8-in. connexions and centre-valve complete; One Station-Meter, to pass 8000 feet per hour; One 18-in. Governor, one 8-in. do.; One 4-horse high-pressure Steam-Engine; One of Jones's Exhausters, with 10-in. connexion, valves, and by-pass; One Exhauster Governor, by Braddock (nearly new); Three Iron Roofs, 26 ft. 6 in. span by 120 ft. long (total); 45 iron D Retort Mouthpieces, 12 in. by 15 in.; 30 do. do., 18 in. by 13 in.; 45 Ascension-Pipes, 5 in. to 4 in.; 30 Ascension-Pipes, 5 in.; 45 H Pipes, 4 in. to 3 in.; 30 H Pipes, 5 in.; 45 Dip-Pipes, 5 in.; 30 Dip-Pipes, 5 in.; 7 lengths of D-shaped Cast-Iron Hydraulic Main, 6 ft. each; 6 lengths do. do., 7 ft. 3 in. each; 2 lengths of Circular do., 6 ft. 3 in. each.

Further particulars may be obtained on application to Mr. W. WRIGHT, the Manager.

Gas-Works, Shipley, May 27, 1870.

SMALL Cast-Iron Gasholder-Tank, about 29 ft. diameter by 14 ft. deep (second hand), to be DISPOSED OF cheap. Now being removed to make room for extensions.

Apply to S. CUTLER AND SONS, Contracting Gas Engineers, Millwall, LONDON.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The HALF-YEARLY ORDINARY MEETING of the Imperial Continental Gas Association was held at the City Terminus Hotel, Cannon Street, London, on TUESDAY, the 31st ult.—Philip Twells, Esq., in the chair—when the following resolutions were passed:—

Resolved unanimously—"That the report upon the affairs of the Association now read be received and entered on the minutes."

Resolved unanimously—"That a dividend of £2 10s. per share, and a bonus of £1 10s. per share, be declared upon the 28,000 shares of the Association, for the half year ended the 31st of December last; and that the said dividend and bonus be payable, free of income-tax, on and after the 15th inst."

Resolved unanimously—"That John Wilkin, Esq., be re-elected a Director of the Association."

"That Nathaniel Montefiore, Esq., be re-elected a Director of the Association."

"That Julian Goldsmid, Esq., be re-elected a Director of the Association, and that Thomas Newton Stokes, Esq., be re-elected an Auditor of the Association."

"That the cordial thanks of the meeting be given to the President and Directors for their able management of the affairs of the Association, and to the Chairman for his conduct in the chair."

By order of the Board of Direction,
ALBERT F. JACKSON, Secretary.

30, Clement's Lane, Lombard Street,
London, June 1, 1870.

COAL TAR.

TO BE LET, for One, Two, or Three years, the TAR produced at the Works of the Sunderland Gas Company, from the 1st day of July next. Quantity about 250,000 gallons per annum.

The principal manufacturing station of the Company has a siding on to the North-Eastern Railway, and is close to the South Dock.

The Directors will receive tenders until Tuesday, the 14th day of June.

Sunderland, May, 1870. J. H. COX, Secretary.

GAS EXAMINER.

THE Metropolitan Board of Works hereby give notice that, under the provisions of the South Metropolitan Gaslight and Coke Company's Act, 1869, they are about to appoint a GAS EXAMINER to test daily the gas supplied by the above-mentioned Company, at the testing-place appointed by the Gas Referees, in Hill Street, Peckham. The salary of the Examiner will be £80 a year, to commence from the date of his entering on his duties.

Full particulars as to the duties of the office and the conditions of the appointment can be obtained on application at this Office, between the hours of 9 a.m. and 4 p.m., or on Saturdays between the hours of 9 a.m. and 2 p.m.

Application in writing, stating the age of the candidate, and forwarding certificates of competency, should be addressed to the Clerk of the Board at this Office.

No application will be received after 10 o'clock on Thursday, the 9th of June next.—By order,
JOHN POLLARD, Clerk of the Board.

Spring Gardens, May 31, 1870.

THE Directors of the Tottenham and Edmonton Gas Company are prepared to receive TENDERS for 9000 tons of best GAS COAL (not cannel) as free as possible from dirt and pyrites. The price at per ton to include all charges for delivery on the Gas Company's siding at Angel Road Station on the Great Eastern Railway, in the quantities and at the dates mentioned below:—

July 15, 1870	600	tons
Aug. 15, 1870	900	,,
Sept. 15, 1870	1000	,,
Oct. 15, 1870	1200	,,
Nov. 15, 1870	1300	,,
Dec. 15, 1870	1500	,,
Jan. 15, 1871	900	,,
Feb. 15, 1871	600	,,
Mar. 15, 1871	500	,,
April 15, 1871	500	,,
	9000	

The Coal will be weighed on the Gas Company's weigh-bridge.

Tenders to be sent, stating name of Coal offered (whether by rail direct or by sea), on or before Friday, the 17th of June next, marked "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender.—By order,
JAMES RANDALL, Secretary.

Gas-Works, Tottenham, May 30, 1870.

THE Directors of the Tottenham and Edmonton Gas Company are prepared to receive TENDERS for the TAR produced at their works for One year, from the 1st of July, 1870. Quantity about 90,000 gallons.

Further particulars may be had on application at the works.

Tenders to be sent, marked "Tender for Tar," on or before Friday, the 17th day of June next.

The Directors do not bind themselves to accept the highest or any tender.—By order,
JAMES RANDALL, Secretary.

Gas-Works, Tottenham, May 30, 1870.

TO TAR DISTILLERS, &c.

THE Directors of the Kingston-upon-Thames Gas Company are prepared to receive TENDERS for the surplus TAR produced at their works, at Kingston, from July 1, 1870, to June 30, 1871. Tenders to be at per gallon f.o.b. the contractor's barge.

Particulars may be obtained from Mr. James Watson, Engineer, at the works.

Tenders to be sent to Mr. W. A. FRICKER, Secretary, Gas Offices, Church Street, KINGSTON, on or before the 15th of June inst., endorsed "Tender for Tar."

The Company do not pledge themselves to accept the lowest or any tender.

THE Directors of the Aldridge Gas Company, Limited, are desirous of receiving TENDERS for the erection of their WORKS complete.

Plans and specifications may be seen at the Offices of Messrs. George Hedley and Co., 5, George Street, Wolverhampton, Gas Engineers, and sealed tenders, endorsed "Tender for Gas-Works," are to be delivered, addressed to the Secretary of the Company, on or before Tuesday, the 21st day of June.

The Directors do not pledge themselves to accept the lowest or any tender.—By order,
HENRY PALMER HARRISON, Secretary.

Whetstone Road, Aldridge, June 2, 1870.

T. EVANS & SONS, Retort-Setters and GAS-OVEN BUILDERS, having done the work at various Gas-Works in England and Wales for many years, can be well recommended. Testimonials and references on application.

Communications to be addressed to the Gas-Works, Cannock, near STAFFORD.

SWANWICK CANNEL.

The yield of this Cannel is liberal, the illuminating power large, and coke good.

For prices and terms, apply to

H. BOAM, 1, Darwin Terrace, DERBY.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, E.C., and 138, Regent Street, LONDON. Agents wanted.

CAST-IRON Retorts, Socket-Pipes, with Syphons, and all requisite Connexions, Lamp Columns, Wrought-Iron Tubing, Valves, Street-Lamps, Sight Holes, Furnace Doors, Ash-Pans, Charging and Coke Shovels, Iron Pails, Coke Barrows, Cross Bars, Fire Pots, Pumps, and Iron Borings.

PURIFIERS, CONDENSERS, & SCRUBBERS erected complete, or the materials supplied; and every description of goods in use by Gas-Works, in stock, at wholesale prices, at

Mr. LYNCH WHITE'S,
Old Barge Iron Wharf, Upper Ground Street, LONDON.

TO GAS & WATER METER MANUFACTURERS, MACHINISTS, & OTHERS.

J. H. ROBINSON & CO.,
ENAMELLERS, DIAL AND TABLET MANUFACTURERS,
THE MERSEY WORKS,
347, GRAFTON STREET, TOXTETH PARK,
LIVERPOOL.

Manufacturers of all descriptions of Gas, Water, and Station Meter, Clock, Timepiece, Tell-Tale, and Log Dials, Lettered Addresses, Number Plates, Gauges, Scales, &c.
Superior Articles at reasonable prices.

Established 1811.

READY & SON,
BILSTON STREET BRASS FOUNDRY,
WOLVERHAMPTON
MANUFACTURERS OF
SUN BURNERS, GAS CHANDELIERS,
HALL LANTERNS, BRACKETS, PENDANTS,
And every Description of
GAS-FITTINGS,
Including
MEDIÆVAL FITTINGS FOR CHURCHES, &c.

Large Pattern-Books complete, with Book of Prices, 7s. 6d.

ROBERT MACLAREN and CO.,
EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main-Pipes by an improved Patent, General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS,
&c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
NEAR
BLAYDON-ON-TYNE.

B. CARPENTER'S
IMPROVED
WOOD SIEVES FOR GAS PURIFIERS.

WORKS:
14, JOHN STREET, PENTONVILLE ROAD,
LONDON, N.

The above Sieves are used by the principal Gas Companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.

Testimonials from Gas Engineers who have tested their qualities forwarded on application.

All orders punctually attended to, and estimates given if required.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET,
EDINBURGH.
Established 1840.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 43, Parliament Street, WESTMINSTER. [Office of the JOURNAL OF GAS LIGHTING, &c.]

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

GEORGE NEWTON,

UNION STREET WEST, OLDHAM,

MANUFACTURER OF

IMPROVED WET & DRY CONSUMERS GAS-METERS,

GAS STATION-METERS,

With all the Joints planed,

GOVERNORS, GAUGES, INDICATORS, EXHAUST GOVERNORS, &c.

TERMS, &c., ON APPLICATION.

CATHELS & TERRACE'S

PATENT FOUR-WAY DISC GAS-VALVE

(Being a simplification and improvement of Cathels's well-known Valve) is the best Valve for Gas-Works. It is specially applicable as a by-pass to Condenser, Exhauster, Scrubber, Station-Meter, &c., as, having no springs, ground faces, or other delicate complications to be affected by crude gas, it NEVER SETS FAST. When applied to Purifiers, the utmost facility of change is afforded; the direction of the flow of the gas is seen at a glance, and no unpurified gas can pass into the holders at each change, as happens with Centre-Valves. In either application ONE VALVE SERVES AS THREE OTHER VALVES. The opening and closing are now effected by one movement, and the ports being all on the same level, enables the connexions to be simple lines of straight piping. The closing of one gas-way opens another, preventing the possibility of accidentally stopping back the gas. The Valve has been in general use for upwards of five years, with the most satisfactory results, and is so simple and strong that it may be considered indestructible.

Illustrated Circular, Prices, &c., on application to the Makers,

Messrs. GUEST & CHRIMES,

FOUNDRY AND GENERAL BRASS-WORKS,

ROTHERHAM.

CAROLINE VICKARY,

(ADMINISTRATRIX TO THE LATE JOHN VICKARY,)

GAS ENGINEER, CONTRACTOR, IRON AND BRASS FOUNDER,

EXE ISLAND, EXETER,

(Established Thirty years,)

Respectfully tenders her thanks to those friends who have patronized her since her late husband's death, and having secured an efficient staff for each department of design and manufacture, she refers with confidence to works recently erected by her as a guarantee that all orders she may be favoured with will be completed in a sound and satisfactory manner.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Sluice-Valves of all kinds. (Gas and Water Mains always in stock.)

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs, embracing the Mediæval and other periods.

GAS-METERS (WET OR DRY),

Combining the most recent improvements in principle and manufacture; upwards of 150,000 already in work, giving the highest satisfaction. (A guarantee for five years given with each one.)

Every description of **Plumbers Work,** comprising **Water-Closets, Beer-Engines, Lift and Force Pumps, Cocks for Gas, Water, or Steam, &c.**

Drawings, Specifications, and Estimates of **Gas-Works, Iron Roofs, Bridges,** and light or heavy structures in wrought or cast iron, supplied on application.

CANNEL COAL.—The West Yorkshire Iron and Coal Company, Limited, beg to draw the attention of Gas Companies to their Cannel, of which the following is the analysis made by W. Huggon, Esq., F.C.S.:

Yield of gas per ton . . . . 10,296 cubic feet.
Illuminating power rather over 21 sperm candles.
Yield of coke per ton . . . . 12 cwt.

The actual working, as reported by one of the largest gas companies in Yorkshire, gives results still more favourable, viz.—

Yield of gas . . . . . 10,416 cubic feet.
Illuminating power . . . . 21·89 sperm candles.
Coke . . . . . The same.

We add from the same source the capabilities of the common gas coal—

Yield of gas . . . . . 10,080 cubic feet.
Illuminating power . . . . 14·41 sperm candles.
Yield of coke . . . . . 13 cwt.

COLLIERIES—WEST ARDSLEY, near LEEDS.

For further particulars, address to the Office of the Company, 15, York Place, LEEDS.

POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles.*

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

OLD WEMYSS CANNEL COAL.—Yield of gas per ton, 12,896 cubic feet; illuminating power, 31·75 standard candles. Port of shipment, Wemyss.

Analysis and price on application to Mr. WM. CAREY, Manager, Wemyss Colliery, Kirkcaldy, FIFE.

CANNEL COAL.

MESSRS. GRIFFITHS BROTHERS,
COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their Cannel for gas-making purposes.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to GRIFFITHS BROTHERS, Coppa Colliery, Mold, FLINTSHIRE.

THE
HUCKNALL COLLIERY COMPANY
Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

THOMAS EDINGTON & SONS,
PHŒNIX IRON-WORKS,
GLASGOW,
Manufacturers of all kinds of
GAS AND WATER PIPES,
Branches, Bends, Water-Traps, Tank-Plates, Valves, and general Castings. Also
RAILWAY CHAIRS & SLEEPERS,
AND
GRIFFIN'S PATENT PERMANENT WAY.
London Office, 63, Old Broad Street.

WALTER MABON & CO.,
Engineers,
ARDWICK IRON-WORKS,
FAIRFIELD STREET, MANCHESTER,
MANUFACTURERS OF
IRON TANKS, GASHOLDERS,
GAS APPARATUS,
PIPES, VALVES, IRON ROOFS,
WROUGHT AND CAST IRON GIRDERS.
DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

FIRE-CLAY GAS-RETORTS, &c., CANNEL AND STEAM COALS.

WILLIAM FRASER, Inverkeithing (owner of the Works at which Fire-Clay Retorts were first made), having greatly enlarged his Works, can supply Retorts and other Fire-Clay Goods to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

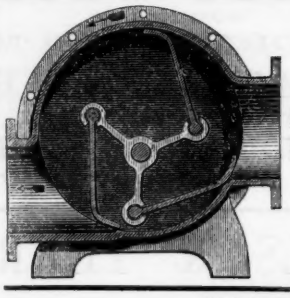
WILLIAM FRASER ships COWDENBEATH PARROT COALS at Charlestown and Burntisland at 12s. per ton; and HALBEATH STEAM COALS, on Navy List, at 8s. 6d. per ton.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

J. T. B. PORTER & CO.,
GAS ENGINEERS,
MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS
Of any extent at Home and Abroad,
GOWTS BRIDGE WORKS, LINCOLN,
AND
JOHN STREET, ADELPHI, LONDON, W.C.

HICKMOTT'S VERTICAL GAS GENERATOR.
GREAT ECONOMY IN GAS-MAKING.
This Generator is charged with Coal by gravity, direct from waggons. The Coke is extracted with a minimum of labour. Fifty per cent. of labour saved, and all distressing labour obviated. Gas of high illuminating power, and desulphurized Coke of great density, suitable for metallurgical purposes.
For particulars apply to
Messrs. HICKMOTT & CO., ENGINEERS, 22, ENGLISH STREET, CARLISLE.

HICKMOTT'S PATENT METHOD OF LAYING WROUGHT-IRON SERVICE-PIPES,
Whereby they are rendered everlasting. For particulars, apply to the above address.



CHARLES HORSLEY'S
PATENT
GAS EXHAUSTER.
(From 250 Feet upwards per Hour.)
Also,
ROTARY TAR AND OIL PUMPS.
For particulars and prices apply to the Patentee,
22, Wharf Road, City Road, London, N.

ROBERT DEMPSTER,
Gas Engineer and Contractor, Rose Mount Foundry, Elland, near Halifax.

R. D. recommends his Fire-Brick Retorts to Engineers and Managers of Gas Companies; they last from 10 to 12 years.

Iron and Fire-Clay Retorts.
Annular and Pipe Condensers.
Scrubbers and Purifiers, all sizes.
Steam-Engines and Exhausters.
Hydraulic Centre-Valves.
Station-eMters and Governors.
Photometers & Pressure-Gauges.
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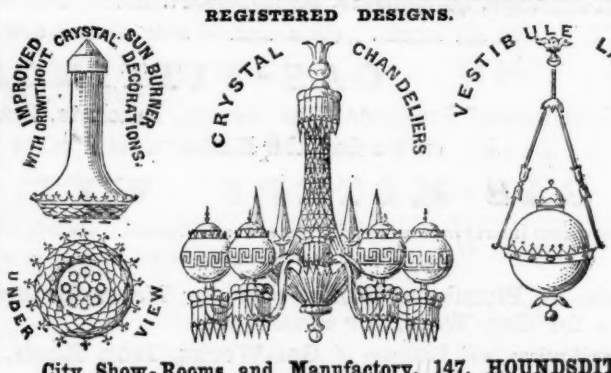

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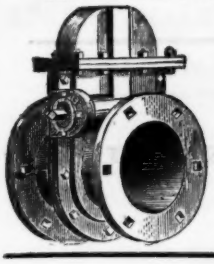

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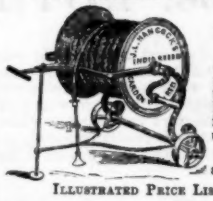

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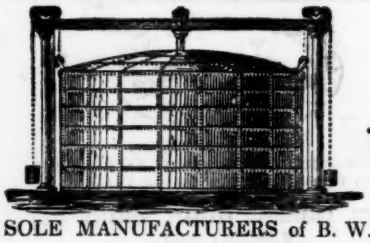

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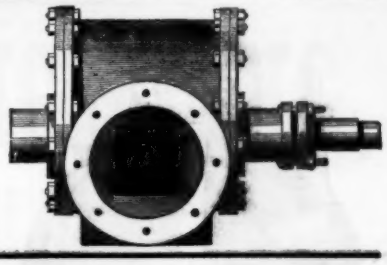

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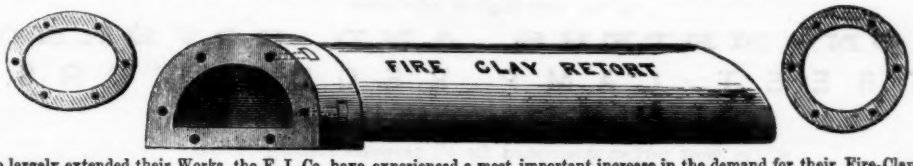

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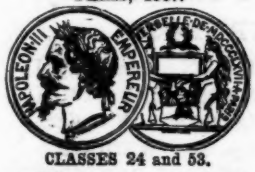

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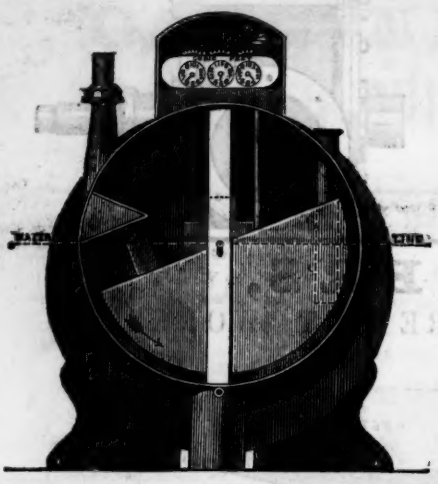

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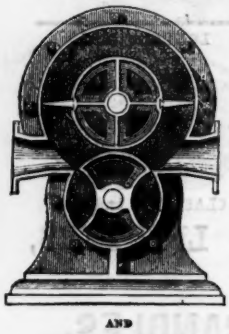

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